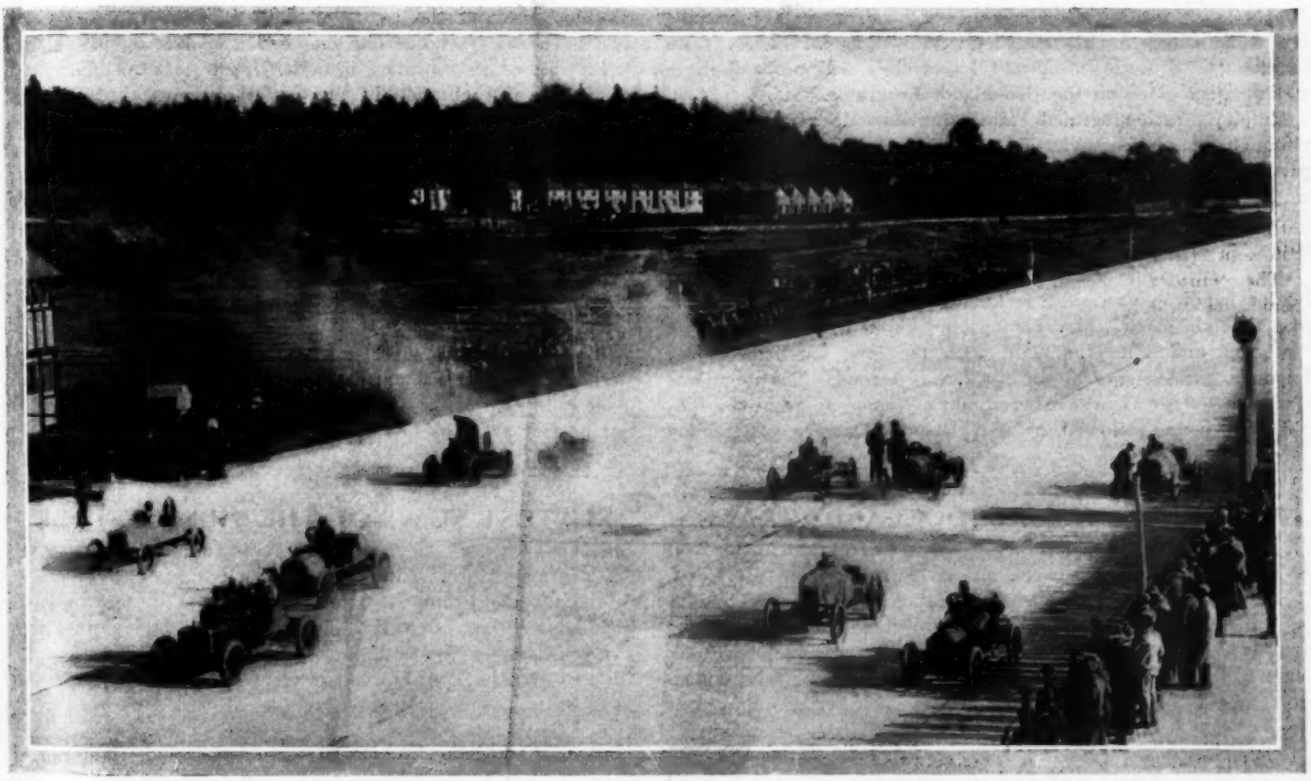
VOL. XXI NEW YORK—THURSDAY, AUGUST 19, 1909—CHICAGO No. 8

THE AUTOMOBILE

BRITAIN'S MOTOR TRACK HAS ENTRIES BUT NOT CROWDS



Start of the Relay Race in the Recent August Holiday Meeting at Brooklands Track, England

LONDON, Aug. 12—Brooklands promises to regain its proper position as the most popular, as well as the largest and fastest automobile track, if its managers can continue to provide such close and speedy racing as was seen at the recent two-day August meet. Although the general public had not forgotten last year's uninteresting exhibitions and was chary of its patronage, there was still a by no means inconsiderable attendance of the track's hardy habitues. The weather, too, was threatening. But several of the finishes were as close as human handicappers could hope to obtain, and were fought right up to tape. Nearly every one asserted that Saturday's sport, in particular, was the best ever seen since the opening of the track.

For the first day five car races and three for motorcycles made up the program. In the August Junior Handicap came one of the best finishes ever seen at Brooklands. Mr. Colmore and his 24.8-horsepower Darracq, starting from scratch, made up his distance on the five-and-a-half-mile double circuit, and succeeded in passing the other eleven competitors, snatching the victory by a hair's breadth from Roy Fedden on the Straker-Squire. Motorcycles had their innings in the third race, and another scratch man, Lee Evans, on his American Indian, put the race away on the finishing straight. The only race which was really disappointing was the July Junior Handicap, in which a little Sizaire "one lunger," which was sent away first, developed an unexpected burst of speed, and far from being overtaken, opened up a wide gap on the other competitors. It was a runaway win at an average speed of 44 miles an hour for the double circuit.

The two-mile sprint race was expected to furnish some fast time, as entrants were required to have an official record of 80 miles an hour. Unfortunately, Mr. Stirling's Brasier went out of commission on the way to the track. Although the time was not quite as fast as might have been expected, for Sir George Abercromby's Napier fell short by five miles of its pre-

vious achievement, the race was nevertheless a good one, calling for skilful work on the part of the drivers in securing the best acceleration.

The July Senior Handicap added another win to the already long record of O. S. Thompson's reliable Austin "Pobble," although the Abercromby Napier was in the lead and within a few hundred yards of the tape when an ignition connection broke. It finished coasting, just beating out an Itala for second place. Lee Evans and his Indian scored again at 60 1-2 miles an hour in the Senior Motorcycle handicap.

The final event was a relay race, a form of contest which rarely fails to be close and interesting. Two cars form a team; when the first completes its circuit the driver passes his voucher to his team-mate, who then makes the second circuit. Here the Austin "Pobble" came to the fore again, its running mate being P. C. Kidner's 20.1-horsepower Vauxhall. Thompson led throughout the first lap, but overshot the finish line, and had to get out and run back on foot to pass the voucher. Second place went to the Abercromby Napier, mated with Bray's little Sizaire. Although Abercromby was next to last to get away for the second lap, he was rapidly overhauling the Vauxhall on the homestretch. There was quite a thrill when one of the drivers, in going out of the straight, got high up on the banking and came within an ace of slipping down again. These team events have proved so successful that they will probably have a permanent place on the Brooklands programs.

Monday's racing seemed rather anticlimactic after Saturday, although in itself above the average. Perhaps this was due partly to the weather. Even the most optimistic felt that it would be necessary to put up with a showery afternoon, but although the clouds remained black and threatening, the rain still kept at a distance.

The comfortable entry of twenty-five cars in the August Senior handicap necessitated running the race in heats, for the first time this year. Mr. Thompson secured the first heat with "Pobble," and Mr. Hammond with the low, flat-shaped gray Lagonda, a newcomer to the track, was second. The next heat was won by Sir George Abercromby's Napier at a speed of 84 miles an hour, followed by Mr. Paton's Darracq. The final went to "Pobble," with 2 minutes 27 seconds allowance, at the rate of 69 3-4 miles an hour. The Napier, from scratch, was a good second and the Darracq third.

After two motorcycle races had been disposed of, with a result of a third victory for the Indian, the field was made ready for the second Grand Prix race. This turned out to be a great disappointment. Mr. Stirling's Brasier had failed to appear, owing to stripped gears, so that the contestants were reduced to three. The starting gate was used for this race. At the rise of the gate, Mr. Loder's big red Itala jumped to the fore, but stopped at the first corner for lack of gasoline, as was afterwards explained. The Weigel, driven by Mr. Whittaker, did not come up to form, leaving the race to Mr. Astley's 59.2-horsepower Napier in easy fashion. The average time was 86 1-4 miles an hour.

For the second race for the O'Gorman trophy, the rules stipulated that the rating of the competing cars was not to exceed 21-horsepower nor the stroke 121 millimeters. The race was to be a long one, 28 miles, and at first it appeared as if it would be another battle royal between those old rivals, the Vauxhalls and the Talbots. Both the latter cars, however, had ignition trouble which put them out of the running, and thereafter the race lay between the two Vauxhalls. That of Mr. Hancock won by a few feet over its team-mate, driven by Mr. Kidner, at the rate of 70 3-4 miles an hour. There was no limitation as to the use of fuel, and Mr. Stewart's Lancia took advantage of this by fitting an oxygen cylinder to feed the carbureter. He did not appear to gain any great advantage by it, however.

The last event on the card, the August Winners' handicap, was finely contested, and won great praise for the handicappers. The principal contestants were the two Napiers, the Vauxhall, and the Indian motorcycle, and the latter secured its fourth well-deserved win. With an allowance of 1 minute 45 seconds on the 5 1-2 miles, it just kept ahead of Mr. Astley's 59.2 Napier from scratch.

In short, it was a most successful meet, even with the small attendance, and every one is looking forward to the next one, to be held October 2. Then, it is expected, Brooklands will at last be free from its last vestige of ill-luck.

PARTRIDGE TRIED BROOKLANDS TRACK

NEW YORK, Aug. 14—E. S. Partridge, of Wyckoff, Church & Partridge, returned this week on the *Adriatic* from his European trip, during which he visited France and Germany, besides spending a week in England. While there he sampled the Brooklands track in the Stearns touring car which he took abroad with him. One of his companions in the eighty-miles-an-hour ride was James G. Holland, a newspaper man well known here in the early days of automobiling. According to Mr. Partridge, the Brooklands course is perfectly banked, and he did not feel the least bit of hesitation in encircling it at racing speed. On his return voyage he ordered by wireless one of the W. C. P. yellow taxicabs to meet him at the dock. This so interested other passengers that they did likewise, and the entire reserve squadron was necessary to satisfy the demand.

ONE-MILE TRIALS FOR LONG BRANCH

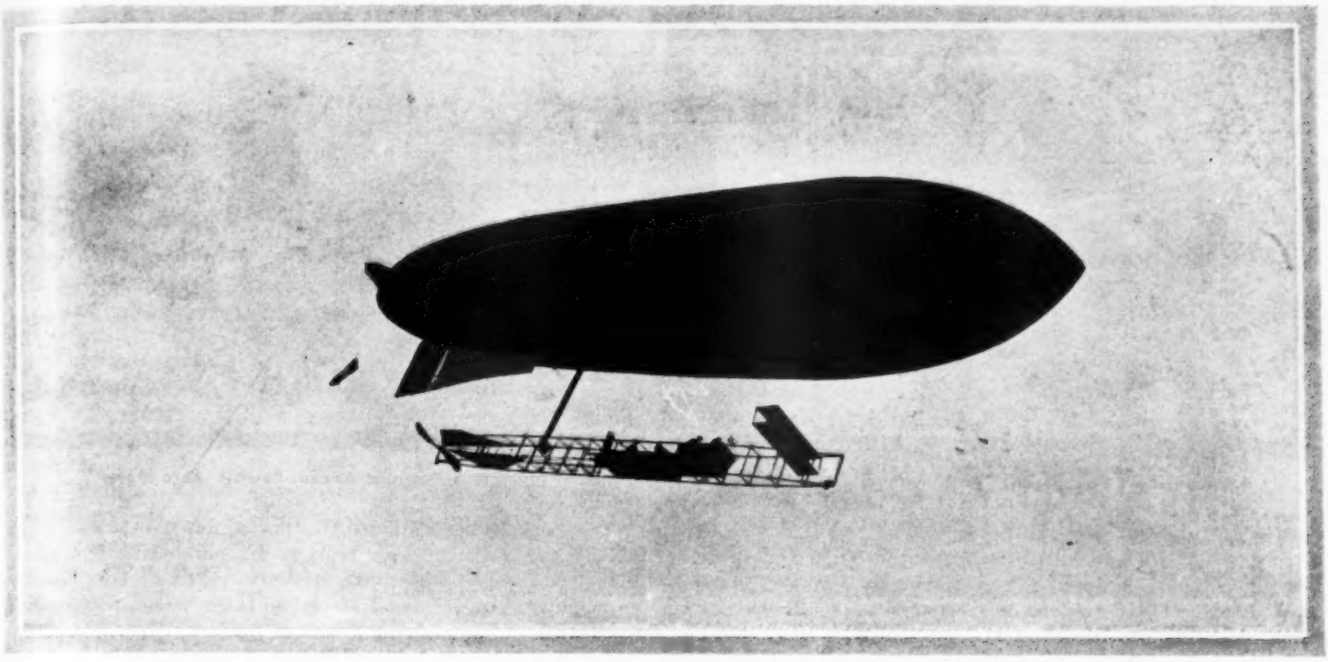
LONG BRANCH, N. J., Aug. 16—Ocean avenue will on Saturday be the scene of a series of mile time trials by automobiles, as a part of an athletic programme arranged by the local board of trade. The city authorities have given permission to close the boulevard to the public, and sanction has been obtained from the A. A. A. for the meet. Prizes of cash, statuary and cups, representing a total of nearly $5,000, will be awarded, and from present indications there will be a large entry list of New York and Jersey coast autoists. The road is well oiled and there is an extra three-quarters of a mile, part for a flying start and the rest for the finish. The committee: M. G. Kahn, M. R. Rothschild, Failing Baruch, C. L. Bowler, Jr., H. A. Content.

LATEST NEWS OF THE MUNSEY TOUR

WASHINGTON, D. C., Aug. 14—Frank H. Trego, secretary of the Chicago Motor Club, has been selected as chairman and referee of the Frank A. Munsey reliability contest to be run September 21-29 from this city to Boston and return. Mr. Trego is one of the best posted technical men in the country and enjoys the confidence and esteem of automobile manufacturers and automobilists generally. With Mr. Trego at the helm, contestants will be assured of having the tour conducted properly. Nineteen cars have been entered in this tour to date, and the probabilities are strong that the number will be increased to 35 before the entries close at noon on September 11. The latest additions to the entry list include two Croxton-Keetons, entered by the Croxton-Keeton Motor Car Co., Massillon, O.; a Spoerer, entered by the Spoerer's Sons Co., Baltimore; a Corbin, by the Corbin Motor Vehicle Co., and a Columbia, by Frank P. Hall, of this city. The latter is the first private owner to enter the tour. The pathfinders who are blazing the route in a Chalmers-Detroit reached Boston early in the week and are now en route home by way of New York.

GUTTENBERG TRACK TO BE MOTORDROME

NEW YORK, Aug. 16—Up on the palisades of the Hudson, where the natural rock forms a hard foundation, is the old Guttenberg track. This was one of the first in the country to be used for automobile racing, many years ago, and now it is to be rebuilt into a modern motordrome, with banked turns and concrete surface. The Palisade Automobile Association acts as the promotor. A schedule is being prepared.

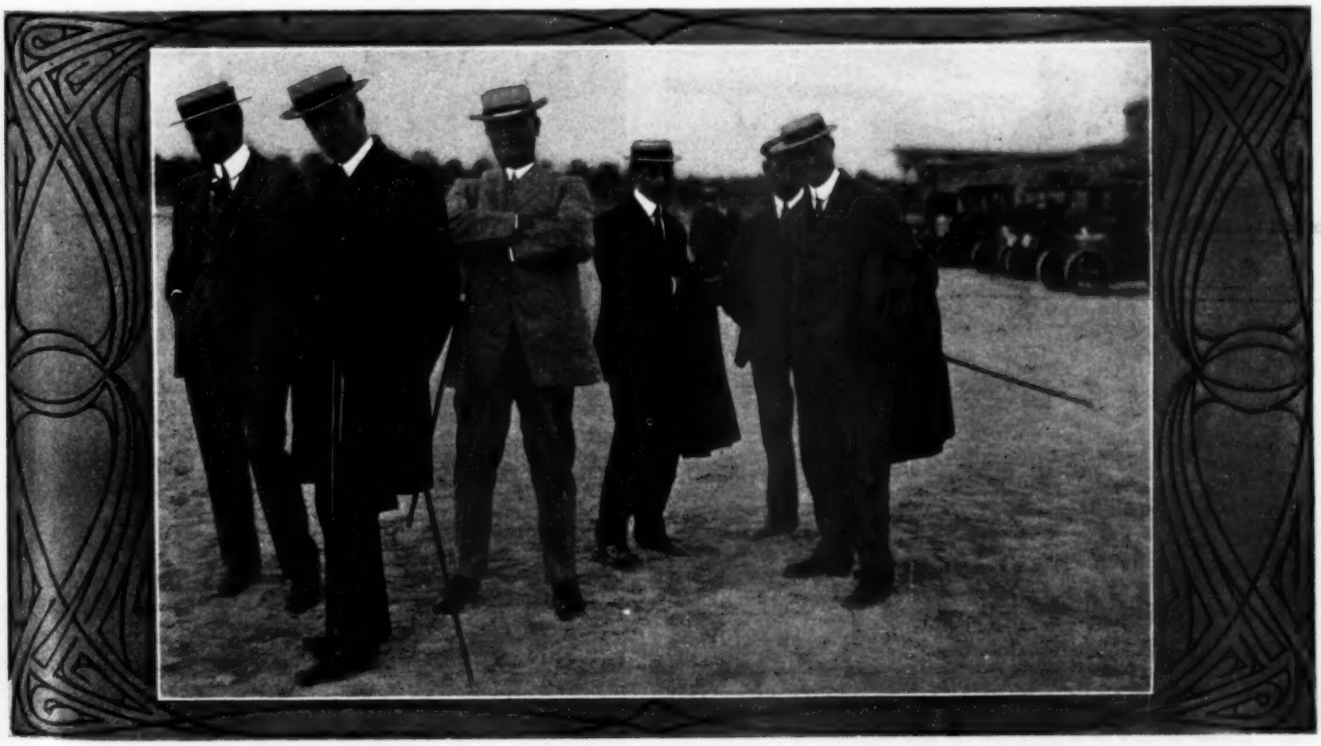


"Zodiac III," a New Type of Dirigible, Making Its Experimental Flights at St. Cyr, France

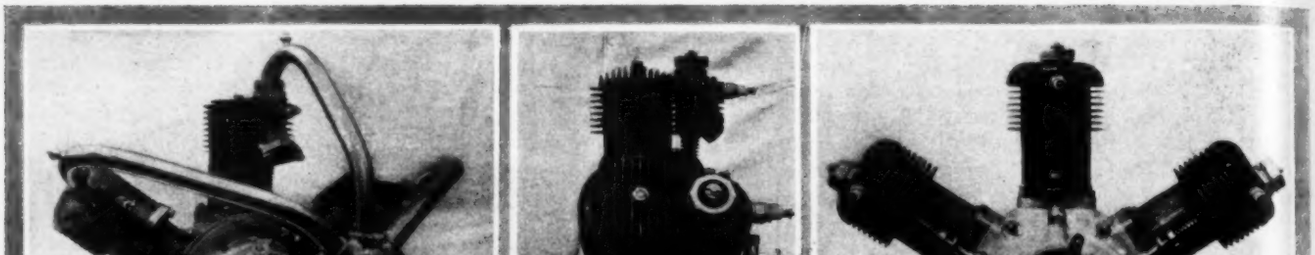
AMERICANS ARE CONCERNED IN EUROPEAN AERONAUTICS

PARIS, Aug. 13—Automobile America is pretty well represented in Paris at the present moment. As aeronautics have taken first place, and indications are that the building of aeroplanes can now be classed as an industry, it is but natural that leaders of the American automobile industry should look closely into the aeroplane as a prospective field for commercial activity. One evening this week, among a group of Americans who had gathered at Issy-les-Moulineaux to watch Bleriot teach one of his pupils to fly, three American factories were represented. Roy D. Chapin, general manager of the Chalmers-Detroit Motor Company, watched the proceedings closely and looked into the details of the Anzani engine. L. H. Kittredge, president of the Peerless Motor Car Company, kept an equally open eye. Charles Y. Knight, who has just come over to Paris from a huge success in England, was the Chicago member of the group. Frank S. Lahm still claims America as his country.

J. N. Willys, of the Overland Automobile Company, is another American manufacturer who passed through Paris this week and left for an extended tour through France. Jefferson de Mont Thompson, ex-chairman of the Vanderbilt Cup Commission, after



Group of Americans Watching Bleriot Flying at Issy-les-Molineaux—Messrs. Chapin, Kittredge and Lahm Are Included in the Group



Carbureter Side of the Anzani Motor | Side View of Anzani | Front of Anzani 25-H.P. Aero Motor

spending a couple of weeks in the capital, left for a tour through Germany and Holland, but will return to France in time to witness the aeroplane races at Rheims this month. Messrs. Chapin and Kittredge also intend to be spectators at the Rheims gathering, the week of August 22-29.

Cortlandt Field Bishop, president of the Aero Club of America, who has been over here most of the Summer, is now busy making arrangements for the reception of his flying machine to be piloted by Glenn H. Curtiss at Rheims. This will be the only American flying machine taking part in the big French races. David Bruce Bishop, brother of the president of the Aero Club, is dividing his time between watching the various French aeronauts and piloting the fast hydroplane boat produced by W. H. Fauber, formerly of Chicago. The Packard Motor Car Company has one of its representatives here in C. G. Moors, general works manager.

Active Preparations for Aeronautical Salon

The opening of the Paris Aeronautical Salon, to be held in the Grand Palais, has been fixed for Saturday, September 25. The closing day is at present Sunday, October 17. As, however, the hall is not needed for any other event, there is a possibility of the show being continued, if this is found desirable. The aeronautical Salon this year replaces the automobile show, abandoned after eleven consecutive years of existence. Last year the aeronautical section joined forces with the commercial vehicle Salon, each of them having a half of the hall. The 1909 exhibition is the first one held exclusively for aeronautics, and will be the first purely aeronautical exhibition of real importance held in the world. All the plans for the show have now been drawn up, the center of the hall being occupied by a spherical balloon, with a dirigible of the Republique or Ville de Paris type to left and right of it. In the centre of the floor space, under the dome, will be a number of stands of honor, important among them being one reserved to the Bleriot aeroplane which flew across the English Channel.

CURTISS ARRIVES, READY TO COMPETE

PARIS, Aug. 12—Glenn H. Curtiss arrived here to-day with his aeroplane, and left immediately for Rheims, where he will compete in the International Aviation Cup race on August 28 as the representative of the Aero Club of America. He is carrying the aeroplane as "personal baggage," so as to lose no more

Comte de la Vlaux (with canes) and Constructor Mallet | Sommer in Driver's Seat of His New Record Breaker

time than possible, and hopes to have it set up to-morrow in time to begin his practice flights and get acquainted with the ground. After the Rheims meet is over Mr. Curtiss will proceed to Brescia, Italy, and will take part in the aeroplane races there.

Curtiss Repairs Quickly

RHEIMS, FRANCE, Aug. 17—In a test flight yesterday Curtiss' motor stopped and he had a severe fall, painfully bruising one leg. He had already made two short flights of two minutes each. The aeroplane was thought to have been seriously damaged, but under Curtiss' supervision it has already been completely repaired.

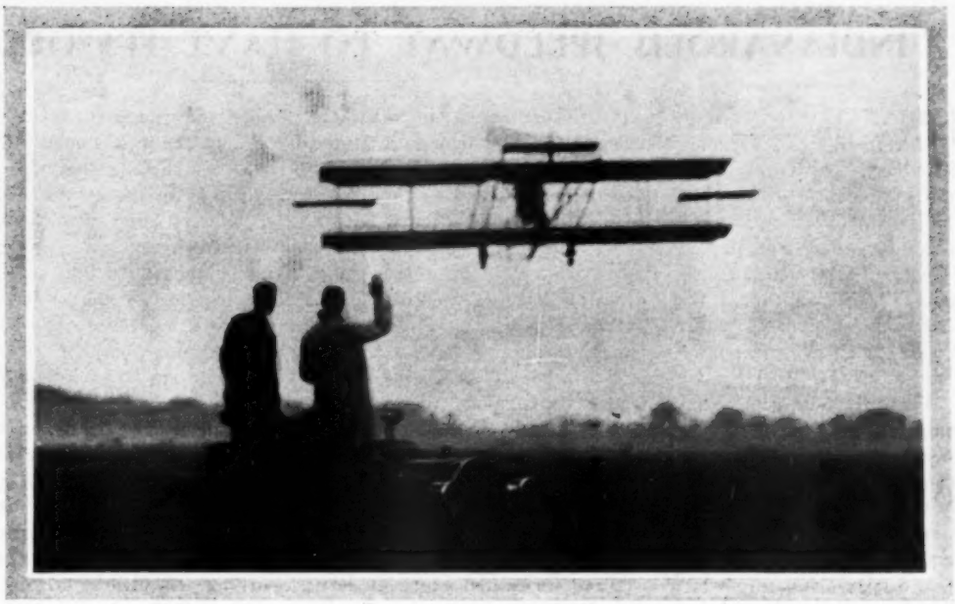
NEW McCURDY FLYER

PETEWAWA, ONT., Aug. 14—J. A. McCurdy and F. W. Baldwin, formerly connected with Dr. Bell's Aeronautic Experiment Association, whose successful *Silver Dart* was wrecked here August 2, have completed a new machine after the same model, which has been tested with good results. It is called the *Baddeck No. 1*. No extended flights were made, but it was proved that the motor and propellers worked properly and that the arrangement of the surfaces was correct. If the trials here come up to expectations Messrs. Baldwin and McCurdy will probably go to England and attempt to win some of the prizes offered for British aviators.

WILLARD FLIES 12 MILES CROSS-COUNTRY

Charles F. Willard, who is operating the Aeronautic Society's Curtiss aeroplane, made a new American record for cross-country flight last Friday. He remained in the air nineteen minutes and thirty seconds, and covered a distance of approximately twelve miles in an irregular square, from the grounds at Mineola, L. I., over Garden City, Westbury, Hicksville, and back to within a mile and a half of his starting point.

The motor was started for the flight about 5 o'clock in the morning. The aeroplane rose gracefully in the air, reaching an elevation of 100 feet as it passed over the trees and telegraph wires at the edge of the grounds, and then headed straight across the plain toward Garden City. For eight or ten minutes the machine was out of sight of the spectators at Mineola. Hardly had he reappeared, traveling at forty miles an hour, when the motor stopped, and Willard brought the machine to earth in a smooth glide. The stoppage was caused by a broken camshaft in the motor. Willard's successful landing was as much of a triumph in its way as his flight. It will be remembered that he received his first lesson from Glenn Curtiss July 18, never having been in an aeroplane before. Since that day he has steadily increased the length of his practice flights and has been uniformly successful, never having had a serious accident.

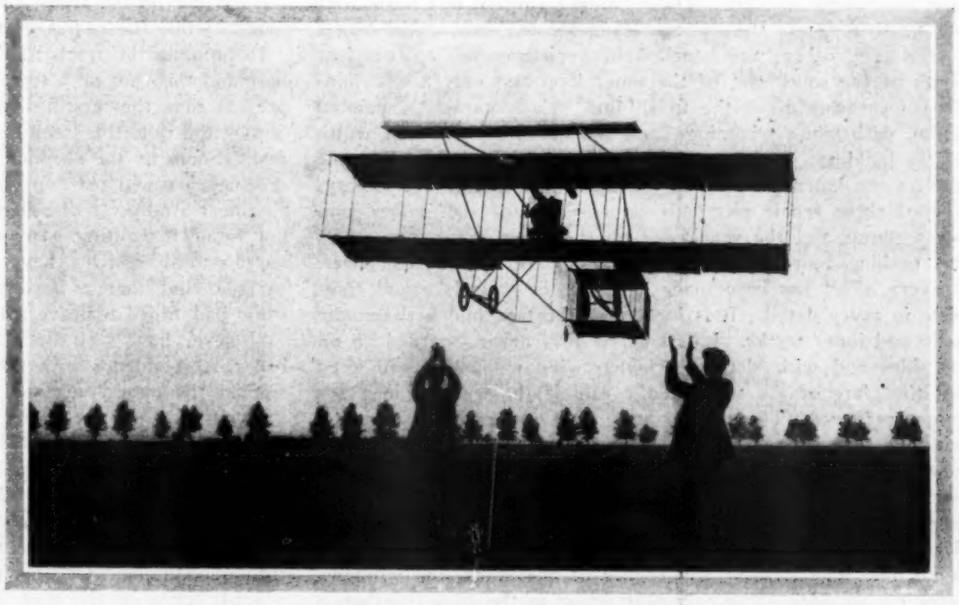


Willard Making American Record for Cross-Country Flight, on Long Island

U. S. NAVY WANTS TO TRY AEROPLANES

WASHINGTON, D. C., Aug. 14—The Navy Department, not to be outdone by the War Department, wants some aeroplanes of its own, and specifications have already been drawn up. Unless Secretary Meyer disapproves—which is not likely, as he was one of the most enthusiastic attendants at the Wright trials—bids on two aeroplanes will probably be advertised for in the near future. The Navy specifications will call for some sort of landing boats sufficiently buoyant to keep the machine afloat if it is forced to alight on the water. The experts see no difficulty in launching an aeroplane from the deck of a battleship; it is pointed out that a fast cruiser will attain sufficient speed to cause an aeroplane to rise from its deck without the use of any special devices. The problem now is to find some way to enable the machine to return to the deck without injury. If the aeroplanes can be made to carry a searchlight they will be almost invaluable for naval operations.

The ground for the new training ground at College Park, Md., has been leased, and work has been started to put it in condition for Wilbur Wright's future flights.



Sommer Aeroplane Which Recently Broke World's Endurance Record in France

INDIANAPOLIS SPEEDWAY TO HAVE ITS GREAT INITIATORY

INDIANAPOLIS, IND., Aug. 16—Everything is in readiness for the opening automobile events on the Indianapolis Motor Speedway, which will be held Thursday, Friday and Saturday of this week. The entry list now numbers sixty-two cars, with the probability that it will grow to more than seventy before Thursday, when the list closes.

Seldom has such an aggregation of drivers been seen at a meet as will appear at the Speedway during the three days. Chevrolet, Dennison, Strang, Oldfield, Zengle, Christie, De Palma, Hearne, Knipper, Lorimer Burnham Ryall, Aitken, Drasch and De Witt are among those who will drive.

When the motoring army invades Indianapolis this week it will be treated to a great surprise party in the way of this great speed enterprise, which is even more stupendous than one imagines in his mind's eye before seeing it. The plat of ground on which it is located is 1 1-2 miles in length and 1-2 mile wide, containing 320 acres of ground. Inside those whitewashed fences is a racing plant complete, on which has been spent at least $400,000 and into which has been inculcated every modern idea in a speed way that such enthusiasts as Messrs. Fisher, Wheeler, Newby and Allison could conceive. A bird's eye view of the layout shows two tracks—one a huge oval, 2 1-2 miles in length and enclosing another which is a sinuous, twisting thing, bending here and curving there until it covers fully as much ground as does the outside circuit. This is the basis of the plant, but everywhere else on the grounds there is more evidence of thought and care in providing not only for the convenience of the manufacturer wishing a place where he can try out his product as well as for the comfort of the spectators.

The main entrance to the ground is at the southwest corner, and a road runs directly from the front gate to the main grand stand, a commodious structure, which is covered and which will hold 10,000 people without crowding. This is not the only provision made for seating the spectators, though, for ranging around the south turn are thirteen miniature grand stands intended for private parties, each of which will hold twenty-eight people. Then, in about the middle of the south turn is another big stand—the bleachers—which will hold 4,200 more.

Aside from the grand stands, there are many other features of the plant, not the least of which are fifteen garages which are to be used by the racing teams, each of which will have its own garage, which will be fitted up with tool bench and other facilities for tuning up cars. These garages vary in size, from one car up to a dozen, the big one being located outside the larger track. The others are bunched in a picturesque position just south of the south end of the inner loop and only a few hundred feet away from the finish line. Each garage is painted green, with white trimmings, and the doors are the full width of the building. Leaving this feature, one finds a row of repair pits on the inner side of the outside track. There are twenty-five of these repair pits, half on one side of the judges' and press stands and the remainder on the other side. These pits are nothing more or less than huge boxes without a cover.

Every effort has been made to make the officials' stand complete in every detail. It is located at the tape and between the main and inner tracks. It is a three-story affair, boarded up on all sides and with slanting wooden windows which will keep out the glare of the sun and the rain if the weather man becomes perverse. The press stand, right alongside, is designed with the same care, there being accommodations for about sixty newspaper men and operators. The man who takes pictures is not overlooked, either, for the ground floor of this pretentious establishment contains a dark room where pictures may be developed. From this press stand, as well as from the judges' stand, one may look at any corner of the track, the windows being on all sides. The only obstruction to the view is a bunch of trees at the northern end of the grounds—a small wood in which may be parked cars if it is found there is not enough room in the vast expanse of infield, which offers 180 acres of space for parking spaces.

Now as to the course itself. Most of those who follow racing matters know that the Indianapolis speedway consists of an outer track 2 1-2 miles in circumference, while another one of similar length occupies the infield. Both are surfaced alike, but the idea of the winding track is to secure conditions approaching what is to be found in the open country. The turns on this course are not banked, but are so gradual that it ought not to be any trick at all to hold them at top speed. This inside course will not be used for the meet this week, for it is not done as yet, but when it is completed it will make a pleasing variation to see a big field of cars strung out over the two courses, which might well be likened to a magic maze.

Every effort has been made to finish the outer track, but it has been only by the hardest kind of work that the task has been accomplished. Night and day of late the men have been working, the track at night being lighted with Prest-O-Lite gas tanks. By this kind of labor the speedway was ready for the motorcyclists, but now comes the job of refining it for the motor car races.

Upon the shoulders of P. T. Andrews, an engineer from New York City, has devolved the job of finishing this work, and right well has he stuck to the job. At times he has had as high as 450 men working, and besides this has employed five steam tractors, 300 mules, 150 scrapers and four 6-ton and three 10-ton rollers. The result of this is an outside track 2 1-2 miles in circumference and with four curves. The banking is 20 per cent. At each end—the north and south—there is a 660-foot turn, and each of the straights measures 3,300 feet. The banking itself is unique, and it is doubtful if anything like it ever has been used in track construction. The track itself runs up 50 feet from the pole, and at this point there is another smaller banking, which is termed a cap, and which rises two feet in 10, making a sort of a bumper or fender. A car can run on it if necessary, but the tendency seems to be to stop skidding in case a car hit it. To further safeguard the turns and prevent any distressing accidents which would result if a car ran off the track, there is a small board fence 24 inches in height, at the cap, which is scientifically designed so that a car skidding up to it will strike the hub caps instead of the wheels, thus holding the car on the track. The banks themselves are 12 feet in height, while the radius of the curves is 840 feet.

In building the track Engineer Andrews first used clay for a base and then put on a top dressing of taroid macadam. At the present time the top dressing needs traffic to smooth it down, but by the time the second meet is held it ought to be lightning fast. Some of the skeptics who have noticed this declare that the big cars will tear up the surface, but this is scoffed at by Engineer Andrews, who declares he has tested the surface and not found it wanting. He points out that 500 teams hitched to narrow-tired vehicles have run over it without injuring the surface, and that a big wagon loaded with 3,500 pounds of stone had failed to leave a trace of its passage.

"I never have seen Brooklands track in England, but I have had correspondence with the people who built it, and also have studied the plans," declares the engineer. "I believe we have a track that will be faster and safer than Brooklands. The English speedway has no fixed radius and easements, while it is flat on the pole. You will notice that our track gives a car a fixed position at any and all angles. A car has the same position on the banks as on the straights, while the approaches are so laid out that it is possible to hit them at 100 miles an hour without skidding. On this track there is no tendency to climb a grade when on the turn, as I have demonstrated to my own satisfaction by tests with weights on different tracks and cars."

Willie Haupt and His Winning Alco "60"

Referee S. B. Stevens

DePalma and Fiat That Won Free-for-Alls

QUAKER CITY "SHOCK ABSORBERS'" MIDSUMMER MEET

PHILADELPHIA, Aug. 14—"The Shock Absorbers," a body of local automobile writers, to interrupt the deadly monotony of a usually meetless month, took a chance to-day and ran off a midsummer race meet and gymkhana at Point Breeze track. The affair was well conducted, but it cannot be said that Philadelphia enthusiasts manifested a proper degree of appreciation of the efforts of the committee to furnish entertainment along gymkhana lines. The Quaker public showed that it preferred action for its money, and during the long-drawn-out preparations, with barrels and wires, potatoes, and spears among the "props" necessary to pull off the stunts, the crowd kept its good humor by audibly criticising the contestants and the management's efforts to amuse them.

The track was as dry as a chip, and the practice previous to the races cut up the turns until they were inches deep in dust. Big fields were an impossibility, and at one time Referee Stevens and Starter Wagner seriously considered postponing the 50-mile Point Breeze Marathon to give the watering carts a chance.

The Marathon, at fifty miles, furnished the only thrills of the day. There were four starters—Heitemeyer's Simplex "50," driven by Frank Lescault; a 70-horsepower Welch, driven by Erwin Bergdoll; American Locomotive "60," with Willie Haupt at the wheel, and the little 18-20 Lancia, Al. Poole driving. Getting away to a good start, Lescault soon forged to the front, followed by Haupt, Bergdoll, and Poole, in the order named. The Simplex steadily increased the daylight between it and the Alco, until, at the end of the thirtieth mile, Lescault was leading by nearly half a mile, the other two cars, which were apparently very evenly matched, having been lapped once by the leaders. Lescault maintained his advantage until the thirty-fifth mile, when, in negotiating the particularly soft and dusty turn leading into the back-stretch, the car plunged into and through the fence, fortunately catapulting its driver and mechanician onto the grass before turning turtle. Neither suffered anything worse than a few scratches and a general shaking-up.

With the Simplex out of it, Haupt and the Alco took the lead, and with a lap advantage on the others, easily retained the position and landed a victory by a lap and a half. Al. Poole made a sturdy fight to snatch the place from Bergdoll, and the big Welch was just 20 seconds too fast for the little Lancia.

Ralph DePalma was the "big smoke" of the day. In the five-mile free-for-all, which was run in heats, best two in three, he staved off his only opponent, Frank Lescault, in the Simplex "50," and won in the comparatively slow time of 5:35 2-5 and 6:02. In the 10-mile handicap, however, he gave the spectators a run for their money. He had to, for Al. Poole, in the Lancia, was given a start of 1:20, and Harry Davis, in the Moon, 1:45. It took seven laps and a half to catch Poole, the leader, and resulted in a new 10-mile record for the track—10:59.

The $1,251 to $2,000 five-mile race for the Frank L. Poth cup resulted in an easy win for the Oldsmobile "35," driven by Tom Berger. Wilkie's Buick dropped out owing to ignition troubles, and Borie's Mitchell did not have sufficient speed to compel Berger to exert himself. The latter, however, met his match in the ten-mile $2,001 to $3,000 race, when Harry Davis drove his 30-horsepower Moon to victory in 12:56.

The one-mile city speed limit test gave the spectators an idea of the ridiculousness of such a gait, and the veritable crawl of the eleven entrants around the mile oval was greeted with a continuous sally of witnesses. No speedometers or watches were permitted in the cars. "Jimmy" Florida, the Vanderbilt and Fairmount Park race driver, was the best guesser of the lot, landing his Locomobile "20" at the tape just two seconds short of the exact time, with George Daley, in a Woods electric, second; and W. B. Dannenhower, in a Franklin, third.

The good-natured crowd greeted the gymkhana stunts with a volley of sarcastic remarks, apparently being of the opinion that such tomfoolery was a waste of valuable time.

Ralph DePalma made two unsuccessful attempts on his own mile record for the track (1:01 4-5). The summary:

50 MILES, POINT BREEZE MARATHON—Q. C. M. C. CUP

No.	Car	H.P.	Driver	Time
1	Alco	60	Willie Haupt	:59:32
2	Welch	70	Erwin Bergdoll	1:01:10
3	Lancia	18-20	Al. Poole	1:01:30

10 MILES, $2,001 TO $3,000—GEORGE H. STETSON CUP

1	Moon	30	H. Davis	12:56
2	Oldsmobile	40	Tom Berger	

5 MILES, $1,251 TO $2,000—FRANK L. POTH CUP

1	Oldsmobile	35	Tom Berger	7:57
2	Mitchell	30	Cherie Borie	

10 MILES, HANDICAP, FREE-FOR-ALL—HOTEL WALTON CUP

1	Fiat Cyclone (Scr.)	60	Ralph DePalma	10:59
2	Lancia (1:20)	18-20	Al. Poole	
3	Moon (1:45)	30	H. Davis	

5 MILES, FREE-FOR-ALL—M'DONALD & CAMPBELL TROPHY

FIRST HEAT:

1	Fiat Cyclone	60	Ralph DePalma	5:35 2-5
2	Simplex	50	R. Heitemeyer	

SECOND HEAT:

2	Simplex	50	Ralph DePalma	6:02
1	Fiat Cyclone	60	Frank Lescault	

MILE TIME TRIALS FOR TRACK RECORD (1:01 4-5)

1	Fiat Cyclone	60	Ralph DePalma	1:01 4-5
			Second trial	1:02

1 MILE, SPEED LIMIT TEST, 12 M. P. H.—BAILEY TROPHY

1	Locomobile	20	J. W. Florida	5:02
2	Woods Electric		G. W. Daley	5:19 3-5
3	Franklin	18	W. B. Dannenhower	5:30 3-5

GYMKHANA FOR FIRESTONE TROPHY

1	Buick	18	Eddie Wilkie	
2	Simplex	50	Frank Lescault	
3	Oldsmobile	35	Tom Berger	

LOWELL BUSY ON NATIONAL STOCK CAR RACES

LOWELL, Aug. 16—Rapid progress is being made by the Lowell Automobile Club in its preparations for the automobile carnival the week beginning September 6, and everything promises to be in the best of shape for the national contests. The racing cars and drivers are not expected until about August 23, but the A. A. A. contest committee has already taken up its headquarters on the course, between the grand stand and the Vesper Country Club. Several of the racing teams have engaged their quarters, and people anywhere near the circuit who have barns that are not occupied find them in great demand by the manufacturers whose cars will be in the races.

Though the Merrimac Valley 10.6 mile circuit was considered extra fine last year when the first race was held, the Lowell club officials have not been content to leave it as it was, and in all parts of the course repairs are being made which will tend to make it faster and safer than before. Wherever it is necessary the roadway has been widened, the surface scraped and smoothed, corners changed and rebuilt, and before practice begins the whole will be treated with dust-laying preparations.

The Lowell boulevard, a mile stretch from the lower or city end of the course to the grand stand, has been smoothed and rolled and will be treated with heavy asphalt oil and covered with a thin layer of sand, making a resilient but dustless surface. Beyond this broad stretch, where three or four machines abreast can be driven at the highest speed of which they are capable, is about four miles of State road with a surface as smooth as could be desired, and without grades of any consequence. There are, however, a deceptive S curve and other curves, but they will offer no difficulty to the drivers after a little practice. Over this stretch the cars can make fast time and there is plenty of room to pass anywhere.

No Longer a Speed-Reducing Hairpin

At the end of the State road is the upper turn, a veritable hairpin. Last year this presented much difficulty to the drivers attempting to take it at speed because of a large tree that stood just at the point of the turn. This tree has been cut down and the road widened about twelve feet with a gentle slope toward the inner side, giving in effect a banked turn with a macadamized surface. The cars ought to be able to take it without shutting off very much. This turn is regarded as one of the spectacular spots on the course. After swinging around the hairpin turn the cars will enter the back stretch, Varnum avenue, at this point a country road with a dusty surface. It has been widened on both sides and the dust is being scraped away. Oil, which will be used on the State road, as well as on the boulevard, is not considered the proper treatment for this stretch and calcium chloride will be supplied. This part of the course is in the town of Tyngsboro and until the Lowell city boundary is reached, a distance of perhaps two miles, the surface is not of the best, though it will be smooth for the races. The road is winding, with one long climb; in this stretch the road has been built out in places, menacing ledges have been blasted away, and trees too near the highway have been cut down.

The worst place on the homestretch is "the dip." Approaching on a slight curve the driver finds himself on the edge of a precipitous drop with a small bridge at the bottom followed by a long climb, with a curve at the end. Cars took this at forty miles an hour last year but this year they should be able to go even faster, for the rocks that stuck out to the edge of the road at the top of "the dip" have been blasted away, the road down the declivity has been materially widened, and the bridge changed so that there will be no bump.

Reaching the city line the road changes to excellent macadam. It is winding but broad, with little grade. At the lower end for a few hundred yards there is a single car track, but there are macadam driveways of sufficient width on both sides of the flush rails. The cross over from the back stretch to the boulevard is a street with right angle turns at both sides. To prevent the tearing away of the surface at these turns and consequent deep ruts, the Lowell club is having both of them resurfaced with heavy macadam. The back stretch, with the exception of the upper end, and Dunbar avenue will be treated with oil.

A Presidential Box in the Grand Stand

The grand stand, seating 5,550 people, is nearly finished. Opposite the starting line in the middle of the stand is a special box for President Taft and party, who have been invited to witness the races. From all parts of the grand stand there is a fine view down the boulevard and up the State road. Opposite the grand stand is a commodious official and press stand and this will be connected with the grand stand by an overhead bridge, upon which the score boards will be located. A telephone system is being installed around the circuit and telegraph wires will run to the press stand. Near the main entrance of the grand stand is one end of a pile and pontoon bridge that is being constructed across the Merrimac river. On the other side the Boston & Maine railroad company has built a wide platform upon which passengers from the special trains will be disembarked. From there they may cross the bridge directly to the course. Persons arriving on street cars will also be landed at the end of the bridge. Spaces have already been staked out for 5000 automobiles along the boulevard, on the opposite side from the grand stand, and excellent arrangements have been made for reaching these parking spaces.

The entry blanks for the mile sprint races on the boulevard Tuesday afternoon, September 7, have just been sent out. These provide for eleven events, five for stock cars under the A. A. A. price classification, four for stock chassis under the A. A. A. piston displacement and weight classification, a free-for-all and record trials. The entry fee is only $15 so a very large field is expected. Bronzes, shields or sterling cups will be given as trophies in all these events. Flying start will be permitted.

The complete programme for the carnival is as follows:

Monday Sept. 6, 10 a. m.—National small stock chassis competition in three classes at 127.2, 159, and 212 miles, to be started together for the Vesper Club, Yorick Club, and Merrimac Valley trophies and $2,700 in cash prizes. Fireworks in the evening from the temporary bridge over the Merrimac river near the grand stand.

Tuesday, Sept. 7, 2:15 p. m.—Speed trials, mile straightaway with eleven classes, including free-for-all and record trials.

Wednesday, Sept. 8, 10 a. m.—National stock chassis race, distance 318 miles for the Lowell trophy and $2,100 in cash prizes.

Thursday, Sept. 9, 10 a. m.—National Marathon run over the Merrimac Valley course, distance 26 miles. Motor boat races on the river and athletic sports in the afternoon.

Friday, Sept. 10, 10 a. m.—Meeting of the American Federation of Motor Cyclists, six events for $600 in prizes.

Entries are coming in thick and fast. Nineteen additional entries were made on Saturday last, which augments the already large list considerably, and a score or more are expected within the next few days. Those made last Saturday include a string of ten Buicks, to be driven in the various events by Louis Chevrolet, Strang, Burman, Ryall, DeWitt and Arthur Chevrolet; three Maxwells; one Moon, to be driven by Harold Brinker, the western crack; one Allen-Kingston, a Columbia, an Isotta, an 18-horsepower Mercedes, a Bergdoll and a second Apperson. Paul Lacroix has decided to swell the list of foreigners by putting a second Renault among the contenders, with Charles Basle as the pilot.

Walter Christie has entered his new 100-horsepower front-wheel drive racer in the mile straightaway competition and time trials, and Mrs. Cuneo will have her Knox "Giant" in the same, driven by Louis Disbrow. Numerous manufacturers have promised more entries, which will not be announced until the checks for entry fees are paid.

Practices in Water-Cooling

Chapter II

INDIRECT COOLING involves the circulation of a liquid, as water, the function of which is to absorb heat from the cylinders and deliver the same to a current of air, which is passed over the surfaces of a radiator, within which the water, in its heated state, is circulated, for which purpose a pump is used excepting in the cases involving the thermo-syphon principle of circulation. Water-cooled motors, so called, are all of the indirect system, and this is quite independent of cyclic relations, etc. In indirect cooling there are several considerations, as follows:

(A) The specific heat of the liquid.
(B) Boiling point of the liquid.
(C) Difference in temperature of the cooling medium.
(D) Internal surface of cylinder exposed to heat.
(E) Thickness of the cylinder wall.
(F) External surface of cylinder wall submerged.
(G) Conductivity of the metal of the cylinder wall.
(H) Ability of circulating pump or equivalent means.
(I) Internal (wetted) surface of the radiator.
(J) Thickness of walls of water tubes in radiator.
(K) Conductivity of the metal used in the radiator tubes.
(L) External surface of radiator exposed to air.
(M) Efficiency of the radiating surfaces.
(N) Ability of the air propeller.
(O) Distribution of the stream of air circulated.
(P) Specific heat of air.
(Q) Difference in temperature of air circulated.
(R) Effect of "gills."
(S) Effect of incrustation.
(T) Relative values of tubes of various shapes.
(U) Influence of location.
(V) Problems involving advancing and retarding ignition.
(W) Influence of changes in the fuel ratio.
(X) Influence of time, involving speed of the piston.
(Y) Volumetric efficiency changes due to heat.
(Z) Advantages of efficient cooling.

Thermal Capacity of Substances—The thermal capacity of any body is the quantity of heat required to raise a unit of the mass 1 degree on a thermometer which registers sensible temperature. Water is taken as the standard of comparison, and when one pound of water is heated one degree Fahr. the energy expended in the process is said to equal one British thermal unit (abbreviated B.T.U.). The several heat units used are:

(a) British thermal unit (B.T.U.).
(b) French thermal unit (F.T.U.) or (calorie).
(c) Pound-calorie unit (P.C.U.).

For convenience the values of the respective units may be resolved as follows.

$$B.T.U. = P\,F.$$
$$F.T.U. = Kg\ C.$$
$$P.C.U. = P\,C.$$

The last named unit is but little used, although it represents a certain utility in practice when the centigrade scale is used.

When P = weight of substance in pounds.
Kg = weight of substance in kilograms.
F = temperature in degrees Fahrenheit.
C = temperature in degrees centigrade.

Equivalents of thermal units may be determined as follows:

$$F.T.U. = B.T.U. \times 3.968.$$
$$B.T.U. = F.T.U. \times 0.252.$$
$$P.C.U. = B.T.U. \times 1.8, \text{ or } F.T.U. \times 0.4536.$$

Mechanical Equivalent of Heat—Since heat is a form of energy it may be resolved into other units, and Joule's equivalent (mechanical) of heat as determined by him, between 1843 and 1850, was stated as 772 foot-pounds; that is to say, one B.T.U. represents enough energy which, when expended mechanically, will raise 772 pounds one foot in one minute. Professor Rowland, in 1880 (*Proc. Acd. Arts and Sciences*), proclaimed that a difference was found and his determination of the mechancal equivalent of heat was probably nearer to 778 foot-pounds than 772 as fixed by Joule.

It is sometimes convenient to reduce heat to electrical units, which may be done as follows:

$$F.T.U. = I^2 Rt \times 0.24, \text{ and } t = \frac{F.T.U.}{I^2 R} \times 0.24,$$

when,

I^2 = square of current in amperes.
R = resistance of the circuit in ohms.
t = time in seconds.

As a matter of fact it is easier to handle all of these computations, using electrical notation, which to do requires a certain familiarity with the methods in vogue. In the absence of this knowledge it will be necessary to proceed in the customary way, and with the constants as here afforded it should be a sufficiently easy matter to proceed without the other method.

Specific Heat Variations—Water is not of the same density at all temperatures, and since the specific heat is measured in terms of mass and temperature, it follows that a correction must be made for volumetric changes due to temperature when great accuracy is desired. The temperature of maximum density of water is 39.1 deg. Fahrenheit, or about 4 deg. Centigrade. In ascertaining the equivalents of temperature in the several standards it is convenient to proceed as follows:

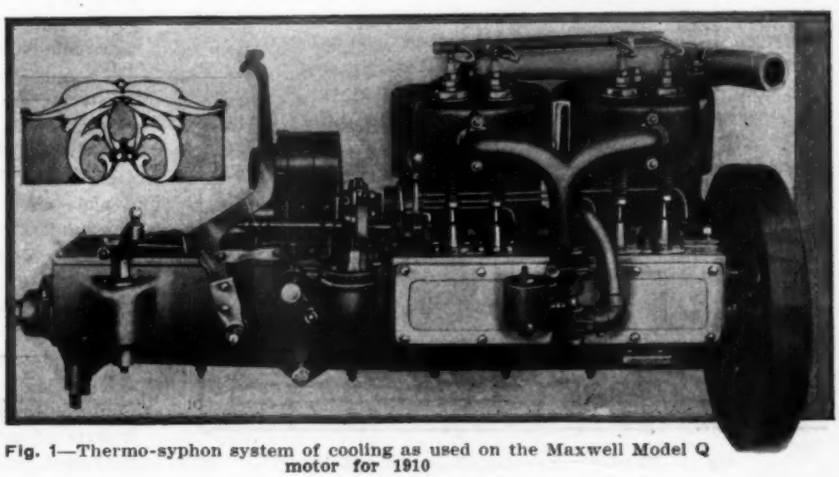


Fig. 1—Thermo-syphon system of cooling as used on the Maxwell Model Q motor for 1910

Extracts from Vol. I., Part V., Chapter II., of a set of books, in preparation, by Thos. J. Fay, covering all phases of automobiling, from the point of view of designers, and in actual service.

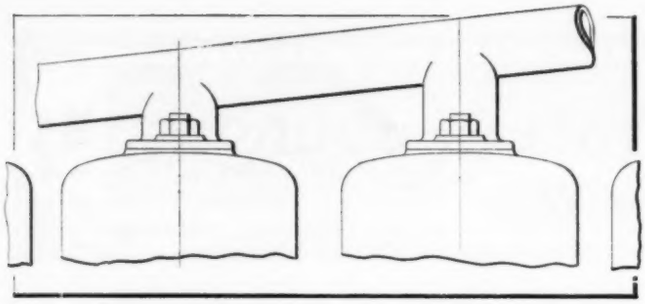


Fig. 2—Rigid water manifold above cylinders

Let F = temperature in degrees Fahrenheit.
C = temperature in degrees Centigrade.
R = temperature in degrees Reaumur.

$$\text{when, } F = \frac{9 \times C}{5} + 32, \text{ or } \frac{9 \times R}{4} + 32$$

$$C = \frac{5\,(F-32)}{9} \text{ and } R = \frac{4\,(F-32)}{9}$$

As an numerical example of the use of the formulae let it be granted that the temperature of maximum density of water is 39.1 deg. Fahrenheit, and to reduce this to degrees centigrade proceed thus:

$$C = \frac{5\,(F-32)}{9} = \frac{5\,(39.1-32)}{9} = 4 \text{ nearly.}$$

Saline solutions, as sodium chloride, calcium chloride, alcohol and water, glycerine solutions, etc., will not have the same thermal capacity as water, the actual thermal capacity of the solution to be used in cooling must be considered, especially as water is the more competent solution, so that, if the ability of the circulating system is limited, the cooling medium may be below the requirements in point of quantity circulated, unless the circulating pump is speeded up or some equivalent method is employed. To illustrate the point it is only necessary to set down some thermal values of saline solutions alongside of water, as follows:

SOLUTIONS	SPECIFIC HEAT
Water	1.
Sodium chloride (20 per cent)	0.829
Calcium chloride (20 per cent)	0.834

If a cooling system is so closely designed that the water will steam under the conditions of its use, it is certain that saline solutions will give trouble, in view of the above, since the quantity of "brine" circulated will be no more and the thermal capacity of the same is less than water.

Just as the thermal capacity of the cooling solution is a factor, when the ability of the same is being measured, so must the thermal capacity of the air used for cooling be considered in any attempt to ascertain the weight of air required for the purpose.

Specific Heat of Air—The specific heat of air, according to Regnault, has mean values as follows:

Between —30 and +10 deg. C. specific heat = 0.23771.
Between 0 and 100 deg. C. specific heat = 0.23741.
Between 0 and 200 deg. C. specific heat = 0.23751.

The specific heat of air at a constant volume differs from the above, and, according to Professor Woods, the value which will most nearly represent the same may be found as follows:

$$\text{Specific heat at a constant volume} = \frac{\text{mean specific heat}}{1.406}$$

The value, at a contstant volume, is usually taken to be 0.1689.

In cooling work, it is of some importance to note the manner of the use of air, and if it is at a constant volume, the ability will be much reduced, as the above values indicate.

Effect of Heat on Volume of Air—When the cooling air strikes a heated wall, the heat is communicated to the cooler air, and the volume of the air is increased in consequence. The coefficient of expansion of air is given as follows:

In the centigrade scale, at a constant pressure, the coefficient of expansion, per degree centigrade, is equal to;

$\frac{1}{273} = 0.003665$, in which 273 represents the absolute zero on the centigrade scale.

In the Fahrenheit scale: at a constant pressure, the coefficient of expansion, per degree Fahrenheit, is equal to:

$\frac{1}{491.2} = 0.002036$, in which 491.2 represents the absolute zero in the Fahrenheit scale.

Absolute Temperature Measurements—The melting point office is represented by:

0 degrees centigrade; 0 degrees Reaumur, and 32 degrees Fahrenheit.

Absolute temperature, unlike the degrees on thermometer scales, which deal with sensible measurements in common practice, as above depicted, date to the point at which an imaginary gaseous medium would be without volume. Absolute temperatures may be measured in degrees centigrade, Fahrenheit, etc., in which the following will hold:

On the Fahrenheit scale: 32 degrees Fahrenheit = 491.2 degrees absolute.

On the centigrade scale: 0 degrees centigrade = 273 degrees centigrade.

With the above considerations as a basis, computations, involving air, may be made as follows:

One cubic foot of free dry air, at the sea level, weighs 0.080728 pounds, and the volume of one pound:

$$v_o = \frac{1}{0.080728} = 12.837 \text{ cubic feet.}$$

Since, under the conditions named, the pressure of the air is equal to 2,116.2 pounds per square foot, (14.682 pounds per square inch) the following will hold:

$$\frac{p_o v_o}{T_o} = \frac{2{,}116.2 \times 12.387}{491.13} = 53.37 = \frac{p_o v_o}{T_o} \text{ and}$$

$pv = 53.37 \times T_o$ as arrived at by Prof. Woods, when,
p_o = pressure due to a temperature of 32 degrees Fahrenheit.
v_o = volume of the gas at the same temperature.
T_o, p and v being the temperature, pressure and volume at any other temperature; T being absolute temperature, at the melting point of ice.

The Latent Heat of Fusion and Evaporation—It is generally considered that the latent heat of fusion does not come into play when reference is had to cooling problems, and this is true, unless account is taken of the performance of excesses of salts, in a saline bath, as calcium chloride. Fusion, in the sense that a solid is liquified, takes place when salts are dissolved, and amonia chloride, for illustration, is a decided refrigerant under such conditions. The ability of solvents is limited, and when the amount of salts which can be dissolved in a liquid, as water, is up to a certain point depending upon the salts and the liquid, the solution is said to be saturated.

A state of saturation is dependent upon temperature to quite some extent, and as the temperature is increased the saturation

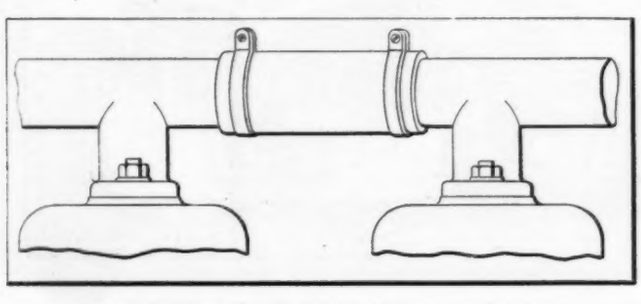


Fig. 3—Flexible connection in water manifold

limit increases also; in other words, if the liquid is heated, the amount of salt which can be dissolved will be increased. It follows, when dealing with saline solutions in a state of near saturation, that some of the salt will precipitate, when the temperature is lowered, only to dissolve again when the temperature is increased; under such conditions the latent heat of fusion would come into play, and there are conditions under which this principle might be of value in cooling work.

The latent heat of evaporation is of the greatest importance, and when water, in the cooler, reaches the boiling point, it is because of this latent heat that the water does not quickly boil away. Water boils at 212 degrees Fahrenheit at the sea level, and if the water enters the radiator at 100 degrees Fahrenheit, the thermal value of one pound of the same, between the entering temperature and the boiling point will be $212 - 100 = 112$ B.T.U. (approximately). When one pound of water is boiled, under a pressure of one atmosphere (14.7 pounds per square inch) the latent heat of boiling is 965.7 B.T.U. From this, it will be observed that one pound of water, if it is turned into steam, in a cooler, if the same is opened to the atmosphere, which is always true, will require the expenditure of nearly ten times as many heat units as will be taken up in raising the temperature of the water from 100 degrees F. to the boiling point.

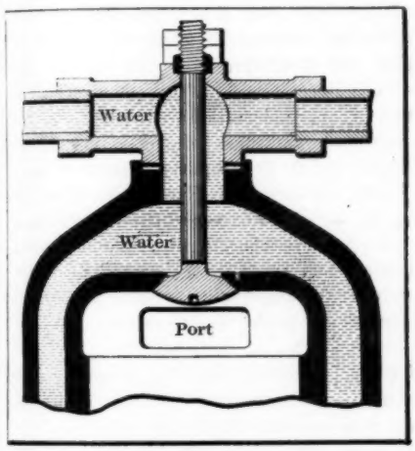


Fig. 4—Showing water connection above cylinder and a liberal body of water

The effect of altitude will be present, since water boils in a vacuum at a lower temperature than it does at the atmospheric. The approximate effect of altitude on the boiling point of water in the radiator, may be stated as follows, remembering that increasing altitude has the effect of rarefying the air just as it is reduced in weight for volume in a vacuum, and in a vacuum water boils at a lower temperature than it does at sea-level pressure.

BOILING POINT OF WATER AT VARIOUS ALTITUDES

Altitude Above Sea Level in Feet	Boiling Point of Water in Degrees Fahrenheit
Sea level	212
1,025	210
2,063	208
3,115	206
4,169	204
5,225	202
6,304	200
7,381	198
8,431	196
9,579	194
10,685	192

It is considered good practice to run the temperature of the water in the radiator at about 202 degrees Fahrenheit, under normal conditions, which allows a margain under adverse conditions, as on a long steep grade, and when cars at the "curb," running the motor free, on a retarded spark. These radiators would steam where the cars are running under normal conditions at an altitude of about one mile. In cases involving steaming radiators under normal conditions, at the sea level, mountain climbing becomes quite out of the question.

Internal Surfaces of Cylinders—The prime object in cooling is to maintain the temperature of the metal of which the cylinders are made, below the point that will produce lubricating trouble, preignition and pronounced rarefaction of the incoming charge. Were the cylinders made of a material such as would not absorb heat, there would be no occasion for cooling, and the principle of limiting surface exposed to the hot products of combustion, on the inside of the cylinders, has the virtue of reducing the cooling requirement without interfering, in any way, with the functions of the motor, and with a gain represented by reduced cooling trouble.

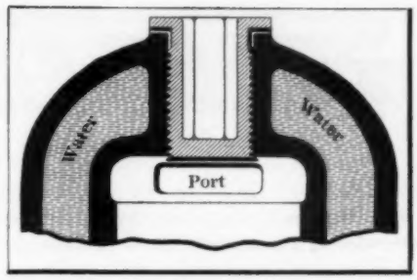


Fig. 5—Liberal body of water above dome of cylinder with side connection

It is common practice to extend the water-jacket, of cylinders, to a point just below the bottom of the stroke, measuring at the top of the piston. Watering below this point would add weight and complication, without delivering an equivalent advantage. The combustion chamber space begins at the top of the piston, at the top of the stroke, and the major portion of the heat must be tapped away through the surface thus exposed, although it is true that overheating would be eminent were the water-jacket stopped off at the top of the stroke rather than at the bottom.

Since all cylinders are round to a point well above the top of the piston, on the top of the stroke, none will differ overmuch as respects the internal surface, up to a point near the fillet of the dome; beyond this point there are wider differences in the several designs, partly due to differences in shapes of domes, but mostly on account of the location of valves, and differences in surfaces of valve-ports. Considering domes only, it is to be expected that a half sphere will offer the least internal surface, since, for a hemisphere, surface for volume is a minimum. Through the use of the formula as given below, it will be found that flat heads offer the greatest surface, and hemispherical domes the least; modifications of both will resolve into areas between the two limits, and when valves are not in the head, it will be necessary to ascertain the increase in area due to port-walls, as an especial effort in each example, since no two designs will be alike, nor can any rule be established which will be general in application.

In considering this phase of the cooling problem, it is a simple matter to assume that surface (internal) is the "valve" which allows the escape of heat, and limiting the surface, limits the escape of heat. This very idea carries with it the logical conclusion that, the greater the effective external surface, in proportion to the internal surface, the cooler will the metal of the cylinders become, and the better will cylinders perform in service, under adverse conditions.

Surfaces May Be Resolved for Comparison—

Let,

d = diameter of cylinder bore.

l = length of cylinder between the top of the piston at the top of the stroke and the point of beginning of the hemispherical dome.

A = area of internal surface of combustion chamber.

a' = area of flat dome not counting area of side walls.

a'' = area of hemispherical dome not counting area of side walls.

a''' = area of side walls neglecting area of walls of valve-ports when valves

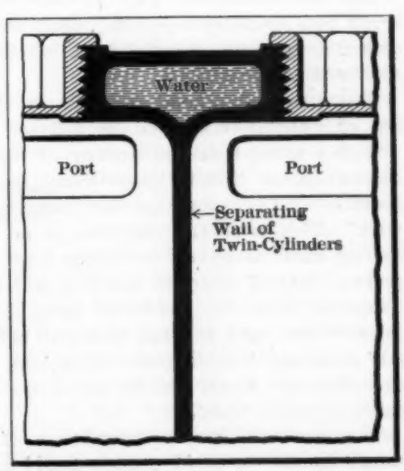


Fig. 6—Common wall for twin cylinders which defeats equal cooling to some considerable extent

are in the head as in some types of cars, mostly for racing.

For hemispherical head types, not counting errors due to shapes of valves in the head:

$$a'' = \frac{\pi d^2}{2}$$

$$a''' = \pi d l$$

$$A = a'' + a'''$$

For flat heads, neglecting irregularities due to shapes of valves, considering types with valves in head:

$$a' = d^2 \frac{\pi}{4}$$

$$a''' = \pi d l$$

$$A = a' + a'''$$

The magnitude of a''' will not be the same when the dome is a hemisphere as it will in flat-head cylinders, since some of the combustion space will be within the dome of the hemispherical contour, which will not be true when the head is flat.

Best Thickness of Cylinder Walls—From the point of view of cooling, which is a matter separate from the strength required to resist pressure, the best thickness of walls to establish, will be the least possible. If internal surface is restricted, thus serving as a valve, limiting the amount of heat which can pass through, the coolest condition of the metal will follow under the conditions as follows:

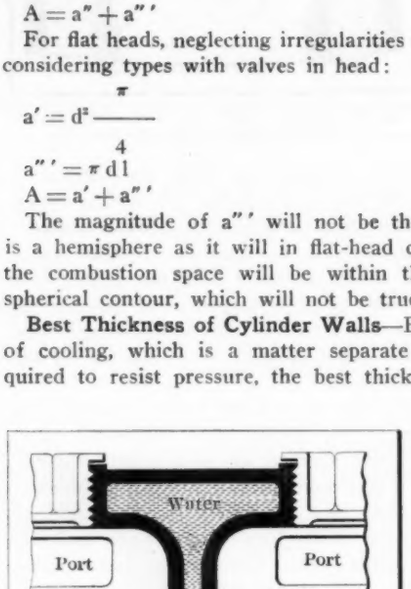


Fig. 7—Separate walls, with a water space between, rendering cooling uniform

(A) With the greatest possible effective external surface.

(B) With the maximum difference in temperature between the metal in the external surface and the cooling medium.

(C) If the walls are thin, since the distance heat will have to travel in the metal will then be minimum.

(D) When the cooling medium is circulated at a sufficiently rapid rate to maintain the greatest possible difference in temperature.

(E) With a cooling medium of the maximum specific heat, highest boiling point, lowest internal heat resistance, best conditions of conduction, and the best conditions of convection, which is a property depending upon the relative motion of the molecular structure of the fluid, which is augmented properly regulated circulation.

That the walls should be thin, is shown by consulting the law of internal conduction, as follows:

"For a given heat conductivity of the material used, internal conduction is directly proportional to the difference in temperature and inversely proportional to the thickness of the wall." This same law indicates, in no uncertain way, that the cooling medium should be a thin layer circulated over a large surface, beyond a certain speed, it will be of small avail to circulate the liquid, for, when the speed is so great that the molecules of the liquid will fail to absorb sufficient heat, which property is retarded by limiting conduction, the circulating effort is excessive, and power will be saved by lowering the rate of circulation of the liquid.

The lower the rate of circulation of the liquid, the thicker should be the layer of cooling liquid over the surface, and in the thermo-syphon system of cooling for illustration, this idea is reduced to a logical conclusion. The thermo-syphon principle of cooling is depicted in Fig. 1 of the Maxwell Type Q motor, which is a 1910 product. Referring to the illustration, and the water connections at the top of the cylinders, it will be noticed that the piping is tapered towards the radiator, at the front, and in order to take full advantage of the principle, the area of the piping is made very liberal. In this system, instead of circulating the water by means of a pump, the whole jacket system is submerged in water, due to the elevation of the radiator, and there is a natural exchange of cold for hot water going on all the time.

Weight of Water at Different Temperatures—Rankine gives, for the weight of water at its point of maximum density, 62.425 pounds per cubic foot. At the boiling point, the weight is less, by 2.77 pounds per cubic foot, which is a mean average of values as given by several authorities. At 62 degrees Fahrenheit, the weight is generally taken to be 62.355 pounds per cubic foot.

In view of the positive difference in weight, between hot and cold water, and since the phenomena of segregation assures that the heavier liquid will migrate to the lower level, this method of cooling possesses the virtue of affording a uniform temperature over the surfaces to be cooled, and a relatively slow but dependable method of circulating the water, thus bringing the cooling influence of the radiator to bear, and while it is necessary to use a radiator of adequate area, it is unattended by such complication as a pump must necessarily involve.

Some Minor Details to Consider—Besides having the piping of adequate area, it is necessary to assure that one cylinder will not rob the other of its share of the cooling fluid, and it is also desirable to maintain tightness of the joints of the piping, which may be done, either by properly contrived manifolds, without flexible joints, as shown in Fig. 2, or, with hose joints, as depicted in Fig. 3. At all events it is desirable to have a substantial body of water above the dome of the cylinders, examples of which are offered in Fig. 4 and 5, with the understanding that the methods of sealing the cylinders, shown, are not here under discussion, nor do they represent the most approved ways.

Fig. 6 shows a dividing wall between cylinders, which is common for both, and that a certain amount of unequal expansion will result from this plan, is a common claim, yet even so, a vast number of motors have been put out in this way, and it has not been indicated that any serious ill resulted. Fig. 7 depicts the plan that represents freedom from unequal expansion, and when room is not at a premium, it is well on the side of safety.

Conductivity of Metal of Cylinder Walls—When cylinders are finished all over, as they are in the examples involving the use of copper jackets, the conductivity of the metal is that of cast gray iron, when cylinders are so made, but in most cases the walls are not finished on the exterior, and the conductivity is that of the iron hampered by a skin, which detracts from the heat-conducting ability to a very considerable extent.

That this skin will act quite as badly as a crust is generally well understood, and as for incrustation, there is bound to be a certain amount of it after a motor has performed in service for a certain length of time. The nature and hardness of the scale will depend upon the substances held in solution in the cooling liquid and to a vast extent upon the amount of boiling that takes place. If the cooling system does not waste water, it is then possible to consider that the amount of scale which will form will be limited to that in the small amount of water likely to be used.

It is estimated that a scale to a depth of 1-16 inch will diminish the conductivity by 13 per cent., while a coat 1-4 inch in depth over the surfaces will diminish the conductivity 38 per cent. That this is at the bottom of some of the troubles experienced with high compression motors is one of the matters to be relied upon, and even if the scale is not baked on it will have substantially the same effect. In certain parts of the country, notably in the vicinity of the Great Lakes, this question of scale (deposits) is uppermost.

(To be continued)

GREASE OR OIL IN TRANSMISSION GEARS?

By H. L. Towle

WITHOUT a doubt the duty imposed on the transmission gears of an automobile, including the bevel gears, is more severe in proportion to the size of the gears than that encountered in any other class of machinery. The steels used for these gears are among the strongest and toughest known in order to resist breakage, and the toothed faces are brought to a file-like hardness to resist wear. The pressures per square inch between the teeth are greater than those of almost any other bearing surfaces, and in spite of their hardness wear is more rapid than would be considered permissible in bearing surfaces of other classes. As it is only the lubricant which prevents these gears from reducing each other to a powder in a short time, the character of the lubricant is a matter of considerable importance.

If there were no other consideration involved one might say without hesitation that a fairly heavy grease would most effectively protect the gears from wear. Undoubtedly where grease can be used it is the most suitable lubricant. Nevertheless, it is in most cases necessary to consider not merely the gears, but the bearings as well, as usually these depend on the same lubricant as the gears. The selection of a lubricant is therefore frequently a compromise between conflicting interests.

If the bearings of the gear case are anti-friction throughout—better yet, if they are not only anti-friction, but separately inclosed and packed with vaseline—one may safely treat the gear lubrication on its own merits, and the choice will probably fall on a grease of medium consistency with a moderate amount of "cling." The purpose of the cling is to prevent the gears from cutting a path in the grease and therefore turning in empty space. On the other hand, in some transmission greases observed the cling is excessive, and the drag due to the churning action cannot help being considerable. If the grease is just soft enough so that it will not quite hold its shape it will continually settle to the bottom of the case and keep the gears supplied. It is not necessary that the case should be filled to the level of the shaft, but only that the smallest gear should dip an inch or so into the grease.

Form of Bearings Influences Lubrication—All this assumes that there is not a plain bearing anywhere in the gear case. In many otherwise anti-friction transmissions, however, there are two plain bearings. One is the reversing pinion bearing, and the other is the bearing by which the squared shaft enters the main driving pinion. As the reverse gear is seldom used, and then only for a few moments (unless one breaks the first speed and has to back up hill), the present writer is not prepared to affirm that a plain bearing at this point prohibits the use of grease. Usually this bearing is supplied through one or two holes drilled into the pinion at the base of the teeth, so that oil or grease is forced in when the pinion is in mesh. It is fair to suppose that grease may be used if these holes are not too small. The other bearing, however—inside the main driving pinion—must be well lubricated beyond peradventure, and if it is of the plain bushed type, the usual one or two one-eighth inch holes drilled at the base of the pinion teeth are far from sufficient to induce grease to enter in sufficient quantities. A plain bearing at this point, therefore, definitely debars grease. In many recent cars, this fact is recognized and anti-friction bearings are employed. Fig. 1 is an example. The shaft *A* is connected to the clutch, and shaft *B* carries the forward universal joint of the propeller shaft. The end *C* of shaft *B* turns in a bearing of long rollers of small diameter inside the main driving pinion *D*, which is formed on an enlarged portion of shaft *A*. *A* runs in a taper roller bearing, and is steadied against possible rocking by shaft *C*. In other constructions a pair of annular bearings is used between *C* and *D* in place of the roller bearing, Fig. 1.

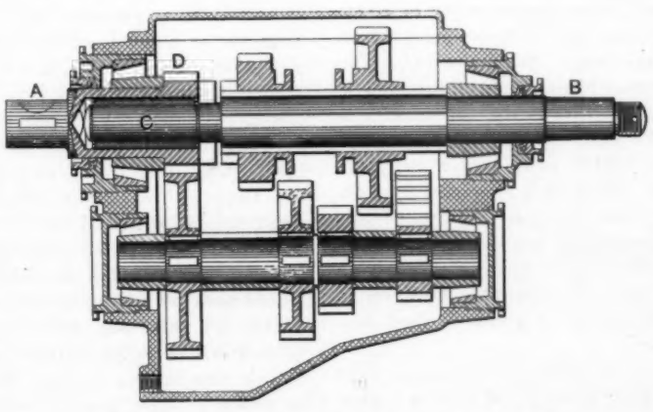


Fig. 1—Typical transmission with roller bearings

In case grease cannot be used in a gear case, the usual alternative is gear case oil, which is a low-priced grade of steam cylinder oil to which tallow has been added to give it as much body as is consistent with ability to flow. It is not a bad plan to add a small quantity of graphite to gear case oil, as experience seems to show that the graphite prolongs the life of plain gear shaft bearings considerably by giving them a glaze which helps them to resist the cutting action of small particles of steel worn off from the gears and floating in the oil. Caution must, however, be used not to add too much graphite. About one-half teaspoonful to the quart is sufficient. An excess is liable to clog the bearings or oil grooves.

Jack Frost Calls for Oil—In cold weather it is sometimes necessary to thin gear case oil to counteract its tendency to thicken by degrees after it is put in. Unless the oil will flow, it is worse than grease. A suitable quantity of cheap machinery oil or even kerosene may be used as a thinner.

Allusion was made just above to the grit worn from the gear teeth. This grit is a factor demanding serious recognition, as it is impossible to prevent the gears from wearing at a rate which even at the slowest would be considered quite inadmissible in ordinary shaft bearings. The steel powder thus ground away is more or less supplemented by actual pieces or fragments knocked off when the gears are shifted, and forms an abrasive which would be admirable if it could be applied to a useful purpose. It seems impossible to prevent this grit from entering the bearings to some extent. Attempts were made in cars of a few years ago to oil the gear shaft bearings (which were plain bushed) by separate oil pockets with oil rings or chains. The results were unsatisfactory, as it was difficult to keep the oil pockets filled and the grit-laden oil from the gears persisted in working along the shafts into the oil pockets, cutting the bushings as it did so. The attempt to use grease in the shaft bearings would probably have been successful if the owners of the cars could have been persuaded to keep the grease cups filled, but their neglect to do this necessitated a hunt for a more nearly automatic system. It seems impracticable to use oil so thin that the grit will settle (except the heaviest chips), and the best alternative appears to be using grease, if possible, for its protective effect on the gear teeth, and using bearings of such form as permits grease lubrication. As already stated, any form of good anti-friction bearing falls in this class, although it may be surmised that ball bearings are better than roller bearings, owing to the chance they give small solid particles in the oil to squeeze out instead of being crushed

between the rolling surfaces. If the principal ball bearings could be enclosed in boxes and packed with vaseline, they might be deemed to be protected as thoroughly as possible, and a few builders of the more expensive cars have gone to this expense, although it must be said that most of them leave the inner faces of the bearings open to the grease from the gears.

Consider the Differential, It Toils Not But Spins Continuously—Let us now consider the bevel gears and the differential. One might be disposed to assert off-hand that these should be packed with grease. However, we are again confronted, as regards the differential at least, with the presence of plain bearings which, if small, are still important. Grease is an ideal lubricant for work of this class *provided* it can be forced to the bearing surfaces either by pressure or by the relative movement of the parts. Bearings fed by compression cups fulfill the first requirement; the majority of universal joints and grease-packed steering gears fulfill the second. But in the bearings of the small differential pinions we have a situation which offers grease of ordinary stiffness small chance to be effective. Figs. 2 and 3 show two typical differentials. The shell *A* has openings of sufficient size to admit grease freely to the bevel gears and pinions within. The pinions run on arms of the spider *B* and have oil holes *C C* drilled at the base of the teeth. The whole arrangement is rotating more or less rapidly, and the tendency of centrifugal force is outward. Of course, some grease or oil will enter the shell in spite of the centrifugal force, but is it not certain that the rolling action of the teeth will force enough grease through the oil holes *C C* if the grease is stiff. It may almost be declared to be the exception rather than the rule to take the differential apart and find the pinion bearings in even moderately good condition. They are usually "cut to pieces," and the thrust washers back of the pinions are not much better off. It is hard to propose a more effectual way of feeding lubricant to these small bearings than by way of the holes *C C*, but in view of this fact it seems clear that oil—as heavy as may be depended on to flow—is the more suitable lubricant.

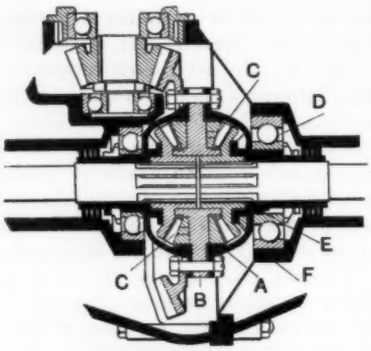


Fig. 2—Differential on ball bearings

In most modern cars, ball bearings *D* are interposed between the sleeves *E* and the stationary housing *F*. In many of the older, and not a few of the modern cars, however, plain bearings are used at this point. This is particularly apt to be the case in chain-driven cars, in which the differential is in the gear box, and the sleeves *E* are extended to a considerable length on each side, one or both carrying brake drums outside the gear box. It is conceivable (though hardly probable) that if grease be used here the external bearings of the sleeves *E* in the stationary bushings will be properly lubricated without special provision being made. But how about the shaft bearings inside these sleeves? The shafts turn relatively to the sleeves whenever the differential is working—and in practice, if not in theory, the differential is working more or less most of the time. If one hunts, he will usually find one or two oil holes hidden away somewhere near the inner ends of the sleeves *E* by which oil is supposed to enter and lubricate the shaft. But any repair man can tell of cut bushings and shafts needing to be reground on account of refusal of the oil to disobey the law of centrifugal force and work in through those holes instead of out. If reasonably fluid oil is used the shafts have at least a chance, but if grease is used they have no chance at all.

Grease That Is Grease—It is, of course, understood that where the word "grease" has been used above, a stiff body is meant—in other words, grease that really is grease. Quite possibly it is the recognition of the limitations of grease in such cases as those cited above that has led the manufacturers of certain greases to add to their product so-called greases which are in reality heavy oils, and are sufficiently fluid to feed by capillarity rather than by pressure. As these products are doubtless called grease for trade purposes, no quarrel need be raised with the name. The important thing to be remembered is that where pressure in one form or another—from a compression cup or from motion of the parts themselves—is available, grease is more suitable than oil; but where no such feeding force is at hand, the lubricant must be sufficiently fluid to feed itself by gravity and capillary action. This, of course, refers to plain bearings only.

To sum up, grease is abstractly preferable for gear lubrication to oil, and is to be preferred wherever the gear lubrication is not complicated with questions of plain bearing lubrication. If there are plain bearings to be lubricated by the same unguent that lubricates the gears, oil is almost invariably essential.

Whether grease or oil be used, it must be renewed occasionally when an examination discloses gritty particles floating in it. A simple way to test the oil is to dissolve a spoonful of it in a tumbler of gasoline and strain it through a cloth, when any suspected metal particles will easily be found.

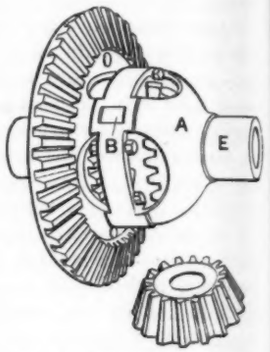


Fig. 3—Spider allows grease to pass

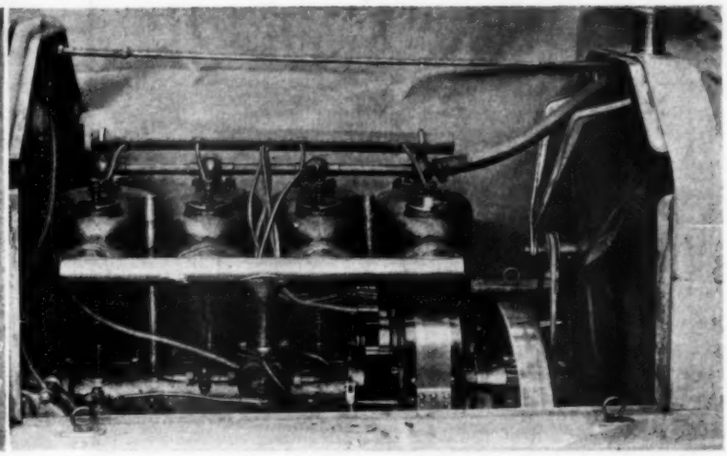
In closing, it should be said that the above remarks apply only to mineral greases. Greases compounded of animal fats have not been considered at all, since while they have their uses, they are distinctly unsuitable for gear lubrication, because of the fact that they remain hard until softened by heat—which heat must generally be engendered by the friction of the rubbing parts themselves. In addition, animal greases are not permanent. They turn rancid in time and form acids very deleterious to bearing surfaces. Where ball or roller bearings are used, grease containing any percentage of animal fats should be absolutely excluded.

FLAME TEMPERATURE OF BURNING GAS

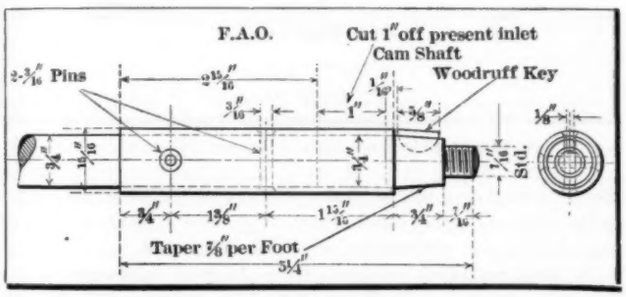
Calorific value of a combustible, as gas made from air more or less saturated with a hydrocarbon, as gasoline, is not all to take into account when reference is had to the intensity of heat, referring, of course, to the sensible temperature. Take, for illustration, hydrogen; a much hotter flame will result if the hydrogen is burned in the presence of pure oxygen than will follow if the oxygen is conveyed into the cylinder with nitrogen, as in air. The number of heat units will be the same in the hydrogen in both cases, but when the air is considered, account must be taken of the nitrogen content, which, it will be remembered, represents 3.35 parts. This nitrogen represents nothing by way of calorific in itself, and it has to be heated at the expense of the heat units in the hydrogen. Since the specific heat of nitrogen is 0.24 (approximately) the large nitrogen content has a marked effect upon the sensible temperature of the burning gas. Likewise, "spent" products of combustion, left over from the previous charge, will reduce the temperature of the burning gas, and even the hydrogen itself has to be heated, and the net result is a lowering of temperature. These events might be looked upon in the light of an unmixed evil, but account must be taken of the heat that would pass off to the water-jacket in excess of that which now passes off that way were the sensible temperature increased, as it would be in the absence of the very nitrogen to which allusion is here made. In view of all the influences, the right plan is to strike a happy medium, rather with the expectation that, on the whole, the best results will follow if no one point is accentuated at the expense of the other and equally important details.

How I fitted a Magneto to a Small Runabout

By Joseph Tracy.



IT is to be remembered that I have always been an advocate of magneto ignition, not alone on the racing cars that I have driven, but also on all kinds of touring cars, so-when I became possessed of a Model "S" Buick which was fitted with battery ignition I at once became obsessed with the idea of converting it into a car having magneto ignition only. My Model "S" Buick is a runabout, carrying two people, and the motor is of the 4-cylinder type, developing 24 hp. I use it largely in the streets of New York for business purposes, in the vicinage of Automobile Row. The car, which is one of the first of this model produced



Sketch of Necessary Machining on Camshaft

by the Buick Company, has had steady and strenuous service, but now that I have changed it from battery ignition to an up-to-date magneto system I feel that others might be interested in the way in which I did it, and hence this story and the copies herewith of the six mechanical drawings showing the change, accompanied by a photograph of the right side of the motor.

Now, there are three systems of high-tension magneto ignition in vogue—the single system, the magneto alone, as the sole source of current supply; the dual system, which embraces the magneto and the battery system combined through one set of plugs, wires and a switch, and which really might be called a system and a half, but in a mechanical sense rather than in a derogatory sense. The third and last system is the double system, which embraces two complete systems, a double set of plugs, a double set of wiring, a magneto and a battery, so that either can be switched on at will, as in the dual system. I decided to install a simple, single system, and finally selected the U. & H. Master Magneto of the C B 4 type for the alteration.

This magneto is of the true high-tension type, and no coil is necessary for its operation. It not only furnishes the high-tension current, but times and distributes it so that the spark occurs in the proper cylinder at precisely the right time in relation to the piston travel. Thus the entire ignition apparatus necessary to operate the motor consists of simply the magneto and the spark plugs in their respective cylinders.

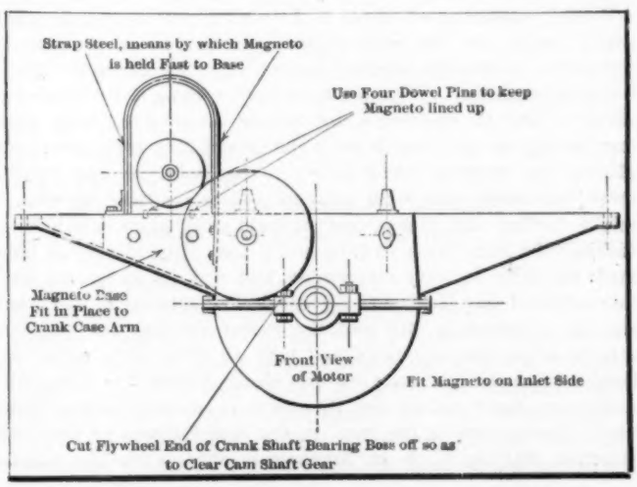
The spark delivered by this magneto is entirely different in its character from the spark produced either by battery and coil systems or by magnetos which employ a separate coil to transform (or step up) the low-tension current they generate. It is not a mere spark leaping across the gap of the spark plug, but an actual arc flame, which plays across the gap for an appreciable length of time.

The principles upon which this magneto operates are not new, having been in use for a number of years, in which time the superior igniting qualities of the spark and the absolute reliability of the system have been thoroughly demonstrated.

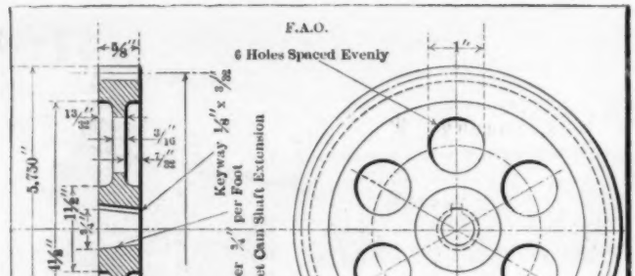
The photograph shows the method of wiring, which consists only of one wire for each cylinder leading from the magneto directly to the spark plug, and a single wire leading from the magneto to the switch on the dash, the four wires being first carried in a hard, red fiber busbar, as shown, on the top of the motor, and from there branching out to each separate sparking plug.

For the detailed plans of the alteration I refer the reader to the six clear reproductions of the original drawings shown herewith, because, in the language of the specifications of the Patent Office, to those familiar with the art they will be readily understandable, and any good mechanic who can read a drawing should be able to thoroughly understand them.

In looking the car over before commencing to make notes for the drawings, I found that the only alterations to be made would be on the right-hand side of the motor. Here the main feature in the way of placing the magneto was the shape of the curved gas inlet manifold. I removed this and replaced it with a perfectly horizontal one, as shown in the photograph. Having no further use for the battery, which was carried under the rear turtle deck, I removed that also. The coil was removed from the dash, and as the magneto carries its own timer internally, I removed the timer and covered up the shaft hole in the crank case with a plate cover, bolted on, as shown in one of the draw-



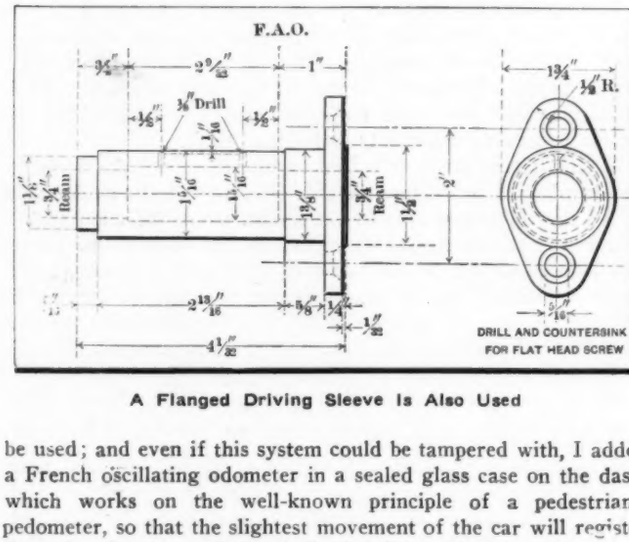
Drawing to Show General Scheme of Magneto Fitting



Detail of New Camshaft Gear Required

ings. The extension of the cam shaft which carries the gears to drive the magneto I carried out through a blind hole in the forward end of the crank case, and all that was necessary to do there being to remove the cover of the hole. The bed plate in the arm of the crank case, on which the magneto rests, I made of bronze, and after having everything fitted I found that it was as easy—a quarter turn sufficing—to crank off the motor on the magneto as it was previously on the battery, and that has been my experience ever since.

In order to prevent "joy" riding on my car in my absence, I fitted a little Yale lock on the dash, which locks the bonnet in place so that it cannot be opened; it also cuts out the ignition service, and, as I have the only key for the lock, the car cannot



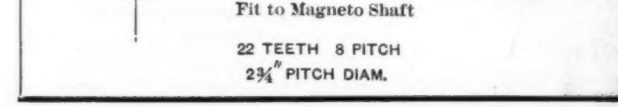
A Flanged Driving Sleeve Is Also Used

be used; and even if this system could be tampered with, I added a French oscillating odometer in a sealed glass case on the dash, which works on the well-known principle of a pedestrian's pedometer, so that the slightest movement of the car will register from the odometer. Beyond all this I did nothing else with the car except to take the steering wheel column a little more toward the rear, giving the car a much more sporty and racy appearance, and placing the steering wheel closer to me, with its gas throttle lever; the spark lever I cut away as useless for fixed ignition. I might further add that a coat of light gray paint which is so fashionable, some black striping and a coat of good varnish have made the little car very presentable, and with its up-to-date ignition system I find it attracts a great deal of atttention, and when the car is standing still and the motor running the magneto driving gears run so quietly and with so little vibration of the bonnet as to deceive many experts along Automobile Row, who doubt very much indeed that the motor is running until a lifting of the bonnet reveals the fact. It also demonstrates to their satisfaction that the U. & H. Magneto is able to produce a good spark when running at an exceedingly slow speed, besides always starting on a quarter turn without spinning the motor.

Any good mechanic can follow out my lines and plan of operation, and the plan may be adapted to use it on many makes of cars where it is desired to change from battery to magneto ignition, and thus bring the car up to date.

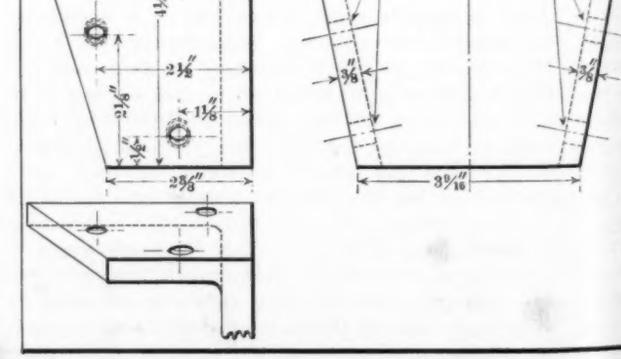
SAFETY IN CONNECTION WITH PRESSURE

Sometimes the exhaust pressure from the motor cylinders as it is led to the gasoline tank is "flaming" and to assure safety it is the custom to pass the exhaust gas to the bottom of the gasoline tank, so that the flame will be quenched in liquid gasoline before the gas is allowed to rise in the tank to the space above the liquid. A further measure for safety consists in placing a copper screen, of close mesh, and two or three layers deep, in the system at the entrance of the gasoline tank, as well as the same kind of a safety device in the reducing valve at the cylinder of the motor. True, the atmosphere in the gasoline tank, as it usually obtains, is non-inflammable, due to the en-



Magneto-Driven Gear Has an Odd Shape

riched condition and the lack of oxygen sufficient to support combustion. On the other hand, it is not considered safe to depend upon the non-explosive characteristics of the atmosphere in the tank, especially in view of the prospect following the time when the gasoline will all be used up, excepting the remaining vapor in the tank, which might then become lean enough to take fire. The screen built on the principle of the "Davy" lamp assures safety if it is of copper, about 120 mesh and about two layers deep, free from seams, and put on without solder which will melt in the heat it will encounter. The tube should be of steel, perforated with small holes.



Bronze Bed Plate for Magneto

AUTOMOBILE SPRINGS AND THEIR CHARACTERISTICS

INVESTIGATION and practice of the members of the Association of Licensed Automobile Manufacturers as to the springs which carry their car bodies and frames make a very interesting tale. Many grades of metal, domestic and foreign, have been used, including chrome nickel steel and steel containing chromium combined with tungsten, vanadium, etc. With special alloy steel, a very superior article can be produced provided the requirements of heat treatment are followed. By some it is advanced that silico-manganese steels will endure longer than high carbon steels. Springs of certain specific analyses are to-day being made which will successfully withstand any test to which they would be subjected.

Typical practice is to have the proper ingredients in the initial product, insisting upon a strict maintenance of this standard when the product is delivered, following with a standardized method of treatment all the way through, including the requirement that the spring will take only so much set under the first test and then stay there. It is necessary to have the furnaces, in which the steel is treated, under pyrometer control, with very slight variation in temperature allowed; and with a so-called "soft" heat, not harsh or severe, as to which the kind of fuel employed is important. The most commonly used heat treatments are annealing, hardening, tempering, hardening and annealing, double annealing, and double hardening and annealing.

It is contended by some producers that a spring with the least arch, that is, the nearest flat, is the safest spring, if enough room for the proper amount of deflection is reserved. This is on the theory that the greater the arch the greater is the fiber strain in a spring.

In connection with front springs, one authority states they should, to preserve proper resiliency, not be thicker than their width; should be fairly stiff, with a maximum deflection of not over one-quarter of an inch per hundred pounds; not off-centered, and have the front eye set higher than the rear eye not less than one-half inch, this latter preventing the car from ducking. That in rear springs, where the problem is relatively easy, the length and width should be as great as possible, if made scientifically as to the spacing of the leaves, the length of the taper and the grading of the steel. There can be made a spring that will take certain dimensions under a given load, and ten thousand other springs which will take the same dimensions under the same load, but it is essential that they have a large number of leaves of special grade steel, specially tempered, with an absolutely correct grading, so that there will be spring play from the center of the eye to the center of the spring, and, too, it is important to have the strains equal in the section of all leaves.

It has long been seen that the carriage spring steel of the last quarter of a century will not do for automobile springs. And successful experiments of the last ten years have given us various satisfactory designs for automobile springs, securing reliability and ease of riding with lower suspension of the body.

The weight, the speed, the traction feature and the variation of passenger load are elements that never until the case of the automobile existed to the same extent in any one vehicle.

QUALITY IN VALVE SPRINGS IN MOTORS

If the valve is light, and if the spring is properly designed and made of good material, it is desirable to have the spring pressure as low as possible, to abort undue pressure on the cams and the mechanism. In many cases the spring pressure is as high as 45 pounds, and that this pressure is prone to cause rapid wear of the mechanism, is assured. If the valve is made as light as the situation would warrant, providing the design is good, and good materials are used in the valve, the spring pressure might be reduced by one-half. It must be remembered that springs will not always remain at the same tension, otherwise it would be possible to consider even a lower pressure than the amount above named. The angle through which the camshaft will rotate while the valve is closing is the matter to be noted, which may be done as follows:

Let,

θ = angle of camshaft rotation while valve is closing under the action of the spring.
s = speed of camshaft in revolutions per minute.
W = weight of valve in pounds.
P = mean spring pressure in pounds.
l = lift of valve in inches.

When,

$$\theta = \sqrt{\frac{l\ (s \times W)^2\ W}{0.67\ P}}$$

In general the valve should close within an angle of the camshaft rotation of 15 degrees. This will only be possible when the valve is very light, and with well-designed springs. Many springs are very lazy in action, due to improper design, and it is important to note that it is more than a question of size of wire, and number of turns of the same. Diameter of the spring must be considered. Sometimes springs are damaged by heat, due to placing them in contact with heated cylinder walls. To abort noise, it is necessary not only to have the springs correct in design but to limit the lift of the valve, and contour the cams to engender easy action.

PROPORTIONS OF ATMOSPHERIC AIR

(1) To find the quantity of nitrogen by volume corresponding to one volume of oxygen, multiply by 3.77092.

(2) To find the quantity of oxygen by volume corresponding to one volume of nitrogen, multiply by 0.265182.

(3) To find the quantity of nitrogen by weight corresponding to one part by weight of oxygen, multiply by 3.313022.

(4) To find the quantity of oxygen by weight corresponding to one part by weight of nitrogen, multiply by 0.301839.

(5) To find the quantity of nitrogen by volume corresponding to one part by weight of oxygen, multiply by 2.6365411.

(6) To find the quantity of oxygen by volume corresponding to one part by weight of nitrogen, multiply by 0.2730071.

(7) To find the quantity of nitrogen by weight corresponding to one part by volume of oxygen, multiply by 3.6629154.

(8) To find the quantity of oxygen by weight corresponding to one part by volume of nitrogen, multiply by 0.3792848.

Formula for correcting the voluume of gases for temperature and pressure:

$$\frac{V}{V^1} = \frac{(273 + t)\ P^1}{273 + t^1\ P}$$

When,

V = original volume.
V^1 = corrected volume.
t = original temperature in degrees Centigrade.
t^1 = final temperature in degrees Centigrade.
P = original pressure.
P^1 = final pressure.
273 = absolute temperature in degrees Centigrade.

Absolute temperature, if measured in Fahrenheit units, instead of in Centigrade, as above given, would be 491.13 below the melting point of ice. The volume of a perfect gas increases 1/273 of its volume at 0 degrees Centigrade for every increase of 1 degree on the same scale. According to this, absolute zero corresponds to the temperature at which the same perfect gas would reduce to nothing.

WEIGHT PER HORSEPOWER

Editor THE AUTOMOBILE:

[1,980]—Will you advise me as to the standard set by automobile builders relative to the horsepower required to carry a certain weight of car. I had a car built using a 24-28-horsepower motor, the car complete weighing 3,200 pounds. The engine does not appear to work properly, don't seem to pull right and does not do the work as it ought. The wheels are 36 inches in diameter and the gear ratio on the high gear 3 1-2 to 1. I have no fault to find with the engine; it is simply a case of knowing if the car is built too heavy. F. G. W.

Pittsburg, Pa.

To arrive at any such figure as you desire, it will be necessary to assume a basis of figuring power, since different makers rate their engines differently. If, then, the A. L. A. M. rating formula is used as a basis, some figures may be given which allow of intelligent comparison. The matter of weights is not in the same category, however, since some unscrupulous manufacturers understate the car weight, others only approximate it, while a third class intending to give it correctly, do not state whether the given weight includes anything but the bare car or not. So, it is hard to obtain anything reliable in the weight line. The tables given in THE AUTOMOBILE at the time of the shows last winter were made up from information supplied by the car manufacturers, and as such, must be taken with a grain of salt.

Thus from the cars of the A. M. C. M. A., the figures for the class costing $1,000 or less, the average of sixteen different weights is 65.6 pounds per horsepower. The lowest figure was 45.8 pounds and the highest 141 lbs. The average horsepower in this class was 19.5 and the average weight 1,280.

In the class $1,000 to $2,000, there are 54 cars of different weight, of which the average is 1,985 pounds, the average power 29.2, and the average weight per horsepower 68.1, which is a slight increase over the cheaper cars. The lowest figure for this was but 44.4, and the highest 91 pounds, the range not being as great as before.

Class $2,000 to $3,000 includes but 28 cars of varying weight, of which the average is 2,510 pounds. The average power is 38.3, from which the average weight per horsepower is found to be 65.4, the lowest yet found. In this class, the lowest was 46.3 pounds, and the highest 167 pounds. The latter was a car having an unusually long stroke, 1.96 times the bore, and would not class with the others for this reason. Eliminating it, the highest weight is 86.0, so this class has also the lowest range of weight values.

Next in order comes the class $3,000 to $4,000, in which are found but 26 cars. These average in weight 2,980 pounds and 41.6 in horsepower. The average weight per horsepower is the highest yet at 71.8. The range of values is also large, 52.5 pounds for the lowest and 107.5 pounds highest. The greatest power was 54.1 and the lowest 25.6. The greatest weight was 3,500 pounds and the lowest 2,250 pounds.

Combining all other cars into one class above $4,000, only 21 are found. The power of these varies from 32.4 up to 72.6, while the weight may be anything between 3,100 pounds lowest and 4,400 pounds highest. The average horsepower is 49.7. The weight averages at 3,550 pounds. Dividing one by the other, the average weight per horsepower is 71.4, lower than the previous class. The range of weight values was from 48.2 lowest up to 111 highest, this being on a limousine.

Summing up the whole five classses into a grand total, there are 145 cars, varying in weight from 900 up to 4,400 pounds and in power from 6.4 up to 72.6. The average weight was 2,418 pounds, the average power 35-horsepower, and the average weight per horsepower, the desired quantity, 69 pounds. Incidentally, the least weight per horsepower was 44.4 pounds in the second class, and the highest 167 pounds in the third class, next to which comes 141 pounds in the first class.

Viewed in the light of the above figures, your car is slightly underpowered for its weight, as you thought. The motor would be rated at 28-horsepower, which makes the weight per horsepower 114 pounds, as against the figure of 69 pounds above. Taking the latter into the weight of your car, and allowing 100 pounds more weight for the larger engine, your car should have a 48-horsepower engine. This will be obtained, according to the rating formula in a four-cylinder engine of 5 1-2 inch bore and in a six-cylinder motor of 4 1-2 inch bore.

MORE WHITE ENGINE

Editor THE AUTOMOBILE:

[1,981]—In reading over your valued publication of date, August 5, we notice the letter from B. F. Ulmer in regard to our rotary valve engine. Now, we are very sorry that this got into print, for we have been trying to keep it a secret until we had developed it to a state where we could place it on the market in competition with the poppet valve engine. Since something has been said about it, we will add that it was built solely for experimental purposes, to determine the relative efficiency of the rotary and poppet form of valve. The results obtained were very satisfactory, but as yet we are not ready to give out the details, other than the fact that the valve is placed directly in the head of the cylinder, which position permits of a spherical combustion chamber. In this way we are able to get a valve opening of 4 1-2 square inches on a 3 5-8 inch diameter of cylinder. We have in course of construction an engine which we hope to exhibit at the automobile show here next fall, which will dispense with all poppet valves, cams, springs, packing, water pumps, water connections, radiator, and many other parts. This engine is almost silent, or as near so as a dynamo. You will note from our description above that there is nothing to make noise. We developed the type of valve used by the Frenchman five years ago, but discarded it for the present one because we are able to get twice the valve opening with the same size. Despite faults, it is superior to poppet valves. Regretting the premature publication of this,

Atlanta, Ga. W. H. and E. F. WHITE.

CONTEST SUGGESTIONS

Editor THE AUTOMOBILE:

[1,982]—As it is proposed shortly to hold another 24-hour race at the Brighton Beach track it would seem as if a special opportunity is offered to those manufactures using air-cooled motors, two-cycle motors and slide valve motors to demonstrate in a convincing and readily understood way that these motors have the advantages claimed for them without the faults which they are commonly thought to possess.

It is true that the vehicles on which they are used have performed well in special tests and in endurance contests, but it is surprising how few users or intending users of motor vehicles know of these performances and many who have heard of them do not fully understand the methods of scoring and cannot appreciate the relative advantages shown by the different contestants.

Moreover, 24-hour contests, in addition to being readily understood by every one and consequently of more general interest, contain less of the element of luck (particularly after the first few hours) than most other contests and less opportunity for deception as the troubles of the contestants can be fairly well seen and any imperfections developed not attributable to mechanical inferiority can be allowed for.

Of course, some makers claim that they do not believe in such contests because of the danger (this has largely been eliminated by the removal of the fences and the provision of fairly level ground for the cars to run on if they leave the track at a turn), but in the opinion of many people this announced belief would possess little weight with these makers if they were more certain of making a good showing.

It would certainly seem as if even a creditable showing of a vehicle having one of the above mentioned motors would benefit its makers more than thousands of dollars spent in special tests, in contests of little general interest and in trying to convince the public by means of claims made in advertisements.

In closing, and in fairness to the most prominent makers of the slide-valve engine car, it might be well to point out that, in addition to its being an imported production, their abstaining from such contests may be due to the fact that it has only lately been marketed by them and they may not have had time to give such contests consideration, particularly as 24-hour races are as yet unknown in Europe. It would, however, be very interesting to have this type of car entered and even if it could only be arranged to enter one of the vehicles which have been imported for private parties it would seem as though the makers would benefit, as any handicap under which it might be operated would be, to a great extent, considered by the public. A. E. OSBORN.

New York City.

While suggestions of this sort are always welcome, it is rather difficult to see how a contest of the kind proposed above, namely, a 24-hour race between cars with air-cooled, two-cycle, and slide-valve engines, would serve any useful purpose. Unless we are very much mistaken, the races as planned are intended to bring out the merits of a number of competing cars, that is, cars which are natural competitors, aside from the matter of price. The cars mentioned do not compete with one another, but rather each stands in a class by itself. So, it would appear that such a contest would not fill in the simple matter of number of entries. Who could blame the makers of air-cooled engines for not caring to pit their product against two-cycle motors, or either one of them against the newest wonder, the slide valve engine?

ANSWERED AND DISCUSSED

CHAIN OR SHAFT?

Editor THE AUTOMOBILE:

[1,983]—Will you please advise me of the relative merits of the two following forms of construction: two-cylinder opposed engine set lengthwise of the car and driving by chain, and two-cylinder opposed engine set crosswise under the hood, driving the car by shaft.

Now that I have disposed of my single-cylinder car, it behooves me to advance one cylinder towards the four and my preference has been for the last mentioned car until recently, when a local automobile man undertook to convince me of the superiority of the former type of construction. He says that the last named method of placing the engine does not allow it enough room, and that, having a lack of room, it will also lack both speed and power, because it hasn't room enough. Similarly, the engine of the form first mentioned happens to have a slightly longer stroke, which he claims will give more power, therefore the car with that engine will travel farther in a day's run than a car equipped as in the second case.

In other words, I would appreciate your opinion of the relative merits of a two-cylinder engine placed in the two different positions. Also, what other considerations go with a two-cylinder engine that might make for or against speed and power? Why is a four-cylinder engine so far superior to a two? F. K. GREEN.

Louisville, Ky.

Your friend was wrong, radically wrong when he said that a lack of room for the engine would prevent it from developing either power or speed, for the engine could be hung on the roof, carried in your arms or put into any old position, whether there was room enough for it or not, and it would develop the same amount of power from a given quantity of fuel. So, if the fuel supply was all right, the position would not influence the power output in the least.

Your friend was also wrong when he stated that a longer stroke engine would carry a car a farther distance in a day than a short stroke. As a matter of fact, if the gear ratio was the same, the shorter stroke would carry your car farther, since to develop the same power necessary to propel the car the short stroke motor must turn over at a higher number of revolutions per minute. Consequently, this form of engine would carry the car farther in a given time. If the gear ratio of the car having the motor with the longer stroke were altered to compensate for the lower speed of rotation, the two cars would travel the same distance, always granting that the two engines were equally well made, so that the fuel economy would be the same.

Speaking of the stroke alone, without regard for the car or the gear ratio, the long stroke engine is supposed to give more power than the short stroke. That is regardless of speed, but seeking power and maximum power alone, a 4 by 6 engine will give more power than either a 4 by 5 or a 4 by 4 engine.

The real argument in the two cases you cite seems to be the relative merits of the chain and shaft for final drive, since the two engines were placed as you found them for the purpose of obtaining the different drives, across the car for shaft drive, and parallel to the axis of the car for chain drive. So, it is a question of chain or shaft, which? Chains are said to be more efficient than either spur or bevel gears, yet nearly 90 per cent. of the automobiles made to-day are shaft drive. This shows that other considerations enter into the matter than just the mechanical efficiency. Thus, chains are noisy, shaft is quiet; chains are very difficult to enclose satisfactorily, and when so enclosed are difficult to adjust and otherwise attend to; shafts are easy to enclose, in fact, all of them are found enclosed on the cars to-day. When not enclosed, chains gather dirt and thus wear rapidly; shaft being always enclosed does not gather dirt and dust, thus outwears chains. Less wear means less adjustment and less care. Chains are hard to lubricate; most shafts are packed in grease or oil, and are self-lubricating. If one of the chains break, on a double chain driven car, it is helpless, and must be towed home. So, too, with a single chain drive, but with a shaft drive, this seldom if ever happens. That is, it very seldom happens that a derangement of the propeller shaft puts the car out of commission.

To go back to the two different engine locations, the fore and aft one would seem to have some disadvantages not previously mentioned. Thus on climbing a steep hill, the front cylinder rises and the rear one falls relative to the crankshaft center line. This would conduce to poor lubrication within the cylinders, as the oil in the rear cylinder would all flow into the cylinder head, the lowest point, where it would mix with and dilute the incoming mixture, while the lubricant in the front cylinder would run to the low point, which is the crankcase, resultiing in both cylinder bores being without oil, or one without any and the other flooded. The engine placed across the frame would not be subject to this annoying trouble.

A four cylinder engine is superior to a two, just as a two has the advantage over a single cylinder, and as a six has "it on" a four, in the frequency and regularity of firing. That is, considering any two revolutions of the crankshaft, the single cylinder has one power impulse; that is, fires once. The two cylinder engine gives two impulses; the four produces four power strokes, and the six, six. As each revolution means two strokes, two turns will be four strokes. The four engines compared, then (if of equal power), will give: one tremendous power stroke in every four; the two cylinder produces two power strokes in four, each therefore being of lesser magnitude; the four cylinders turn out four still smaller impulses in four strokes, one per stroke; while, lastly, the six is so constituted as to produce six power strokes, an average of one every two-thirds of a stroke, and all of still smaller size than those of the four. You can readily see that the smaller the impulses and the more frequently they occur, the more quietly will the engine run, and the smaller will be the wear and tear on the whole of the mechanism.

CEMENT FOR RUBBER

Editor THE AUTOMOBILE:

[1,984]—Will you please let me have several formulas for cement to be used in patching inner tubes. M. H. P.

Newark, N. J.

In any cement for rubber, the cement must come in contact with the rubber, which result is obtained by brushing the surface with naphtha. This softens the rubber, and when partially evaporated leaves it in as nearly favorable condition for adhesion as it is possible to get.

Among the many cements used in rubber manufacture is marine glue. This consists of a pound of the crude rubber (caoutchouc) to one gallon of coal-tar naphtha and twenty pounds shellac, heated gently and poured upon metal plates to solidify. In using, small pieces are melted at 250° Fahrenheit. If required in a liquid form use more naphtha.

A good gutta percha cement is made of two parts of common pitch and one part of gutta percha, melted together and well stirred. When ready this is poured into cold water, which transforms the cement into a hard, brittle substance. To use, this is softened by heating, and at 100° Fahrenheit is a thin fluid.

The basis of nearly all good cements used in tire repairs is either india rubber or gutta percha dissolved in any one of the common solvents, which include benzine, carbon-bisulphide, chloroform and ether. Various other ingredients are necessary for a good cement, as, for instance, if quick drying is desired, some form of dryer is added, and to attain tenacity still other gums, such as rosin, mastic, gumlac, are used.

PLANS FOR A GARAGE

Editor THE AUTOMOBILE:

[1,985]—I want to get plans and suggestions for a small garage which I am about to build. Have you published anything of this kind? If so, kindly send it along. H. M. W.

Dayton, O.

No, we have not published anything that will help you in this matter, but a garage article now in preparation will cover all of the present tendencies in garage construction, and will doubtless furnish you the information you wish. All materials will be dealt with, for the man who wants to build. It will be complete in several numbers, beginning in an early issue.

TWO AND FOUR CYCLES

Editor THE AUTOMOBILE:

[1,986]—Will you kindly inform me through "Letters Interesting and Instructive" just what is meant by two-cycle and four-cycle engines. There are so many different opinions about this that I am very much puzzled to know which is which, and would be glad to have you give me something definite and something upon which I can depend.

Plattsburgh, N. Y. H. J. LANGLOIS.

The difficult thing in this explanation is to make it so simple that anyone, whether versed in mechanics or not, can readily grasp the idea. You doubtless know that in the operation of a gasoline engine there is a regular succession of events, which must occur in the same regular, unvarying order every time. This is called a cycle of events, or, for short, a cycle.

Now automobile engines may be so constructed as to have this cycle take place in varying lengths of time as determined by the number of strokes made by the piston. That is, the cycle may be completed in two strokes, or in four strokes. In the former case the engine is said to work upon a two-stroke cycle and is called a two-stroke cycle engine, the word stroke usually being omitted. In the latter case when the cycle of events is completed in four strokes, the engine is called a four (stroke) cycle engine. There is also an engine built which operates upon a six-stroke cycle, but not being in common use this is not worthy of further attention.

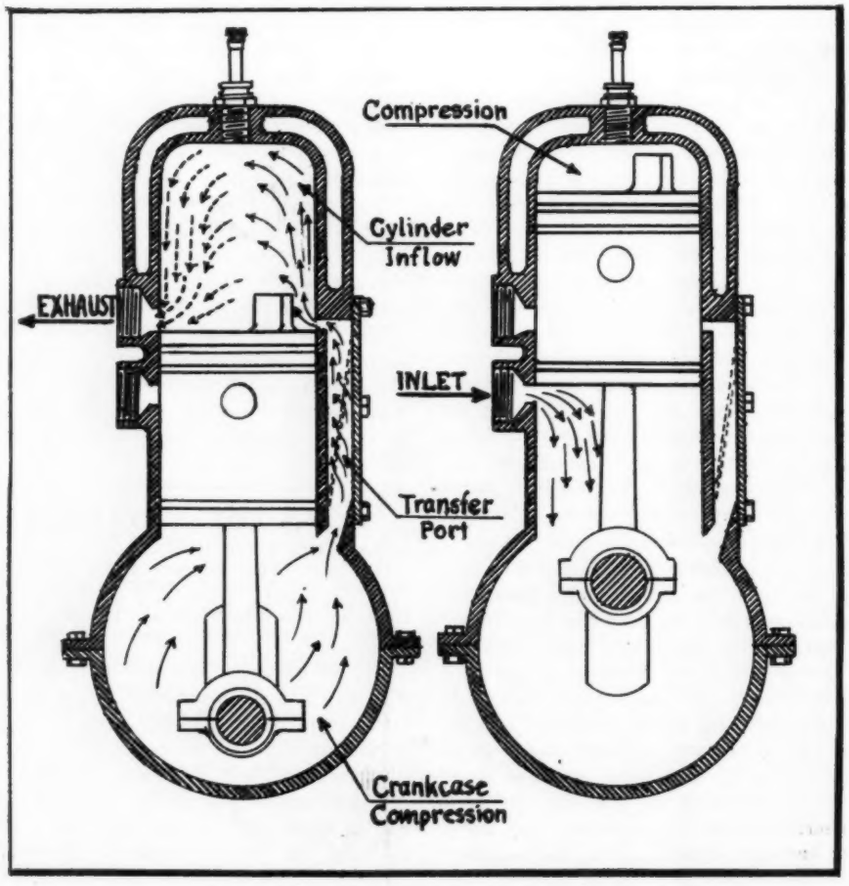
The cycle of events and the order in which they happen is as follows:

1. Suction, or drawing of the fuel.
2. Compression, or increase in the pressure of the fuel mixture.
3. Expansion, following the firing of the compressed charge.
4. Exhaust, or cleaning out the cylinder, so as to resume the first operation, or to allow of repeating the cycle of events.

In the four-cycle engine the first down stroke completes the first action (1), that is, the downward motion of the piston causes a partial vacuum into which the fuel rushes. The stroke being completed and the cylinder filled with gas, the return stroke compresses the charge, action number (2). A spark is then made in the cylinder containing the compressed charge, which burns or explodes more rapidly for having been compressed. In burning or exploding, the gases expand and drive the piston down the second time, this being action (3), and the only useful part of the whole cycle, in so far as producing power is concerned. At the close of this stroke, the cylinder is filled with burned and consequently useless gases, which the ensuing upstroke pushes out into the air or at least out of the cylinder, so as to make place for the next charge of unburned gas. This is action number (4), and concludes the cycle.

In the two-cycle engine, all this takes place in two strokes of the piston, one up and one down, just half the number necessary in the four-cycle. As the cut shows, the left-hand view is that at the close of the expansion the burned gases are exhausting through the exhaust pipe, while *at the same time* the fuel is entering the cylinder from the crankcase, where it has previously been partly compressed. The other view shows the condition just previous to expansion, and at the time when the spark is made to ignite the charge. The fuel in the cylinder has just been compressed, while *at the same time* the fresh charge of fuel was drawn into the crankcase base. The *italics* indicate that to perform the needful actions it is necessary to double up, and it is this doubling up which has held the two-cycle engine back, for with two things taking place in the cylinder at the same time it is hard to say when the one stops and the other commences. This is highly important, as may be seen from a single instance. Thus, how is it possible to stop the fuel from following the exhaust out of the cylinder and in this way waste some of the fuel? Or, on the other hand, how is it possible to have all of the burned gases expelled from the cylinder, so that none of them remain to dilute and render useless part of the simultaneously incoming fresh fuel?

Be that as it may, there is a power impulse on every down stroke, while in the four-cycle engine there is a power impulse on every other down stroke. This statement would lead a person to think that a two-cycle engine would develop twice as much power as a four-cycle of the same dimensions, but such is not the case. Far from it. The very best of two-cycle engines will not develop much over one-fifth more power than the same sized four-cycle.



Sketch of Operation of Two-Cycle Engine, Showing Simultaneous Actions

FIRST BLOCK MOTORS

Editor THE AUTOMOBILE:

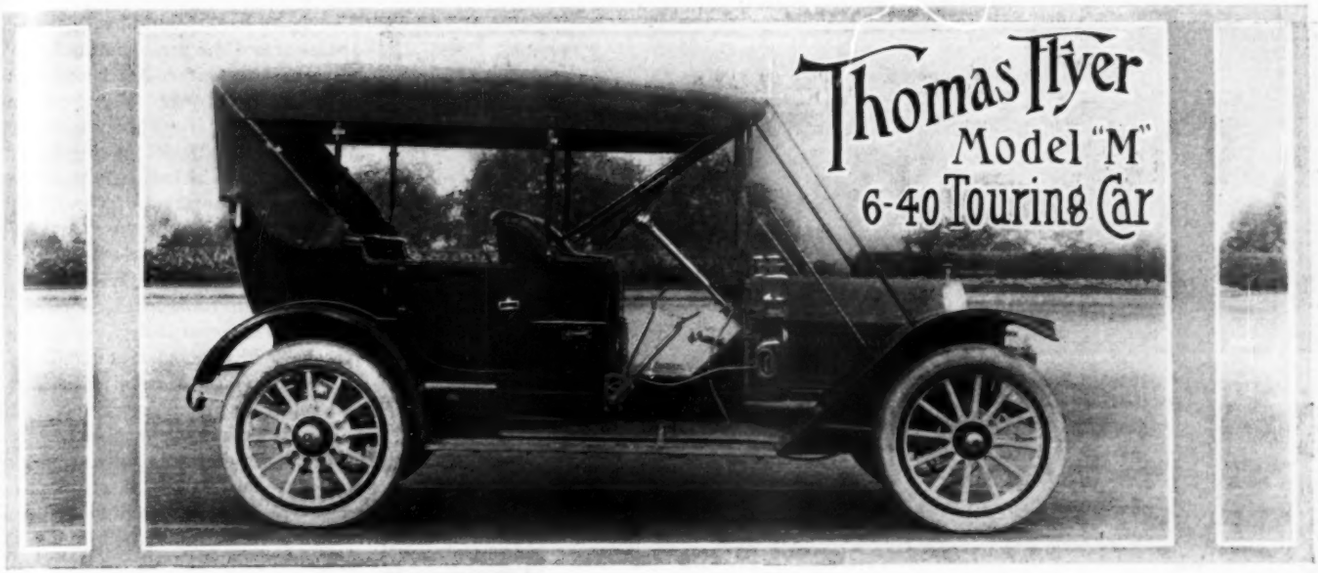
[1,987]—I am an American and proud of it. My grandparents on both sides were ditto, and my sense of justice is well developed, I trust. So it grates when I see an able editor giving credit to a foreign country that belongs to America.

On page 70 of your issue of July 8 you give the French credit for originating the block system of casting auto motors. Now I would not take a single bit of credit from them that they actually deserve. They and their good roads have done much for the auto; but bless you, the block method of casting auto cylinders was used on Duryea double cylinders as far back as 1894. It was continued in '95 and '96, and in '97 the triple cylinder was designed, built and sold for the next ten years. In 1897 a four-cylinder Duryea engine was built having the heads, water jackets, valve pockets, and in fact everything but the cylinder shells, in one piece. This is close enough to the present block method to be called a starter even if the others had never been built.

These various motors were mostly of 4 1-2 bore and stroke, but other bores from 4 to 6 inches were tried. They were shown at cycle shows as far back as 1897 and at every New York auto show from the first up to quite recent years. There is no chance to say that they were hidden and not known by the public. It was a two-cylinder block engine which drove the winning Duryea in the first British event in '96 when it defeated the best three rigs of the French race of that year. CHARLES E. DURYEA.

Reading, Pa.

It was not the intention to deprive Mr. Duryea of any credit naturally due him. So, perhaps it should have been said that the French were the first to push the *en bloc* construction, adopting it widely.



IN in the development of models for 1910, the E. R. Thomas Motor Company, Buffalo, N. Y., took into account the lessons taught by the British "Four Inch" race and incorporated the results thereof in the latest production of the big factory on Lake Erie. Prime among the benefits accruing from that particular race was one that the whole automobile world has now learned, the very marked advantage of the long-stroke motor, both in power and in speed, wear being reduced incidentally.

E. R. Thomas has just returned from a five months' tour of the automobile factories of Europe firmly convinced that the most important new feature for 1910 on the other side will be the long-stroke motor. In explaining his company's departure from past practice as exemplified by the relative bore and stroke of the new model, Mr. Thomas had this to say: "By the long-stroke motor is meant one in which the travel of the piston is greater than the diameter of the cylinder bore. Heretofore, most motors have been what is termed short or square; that is, the stroke was either less than or equal to the bore. The long stroke has the advantage that the engine does not have to revolve so fast to deliver its power. Thus, a 4 by 4 engine must run at 1,500 revolutions to develop its A. L. A. M. rating, while a 4 by 5 motor, which is rated the same, would only have to run 1,200 revolutions, and a 4 by 6 would have to make but 1,000 turns."

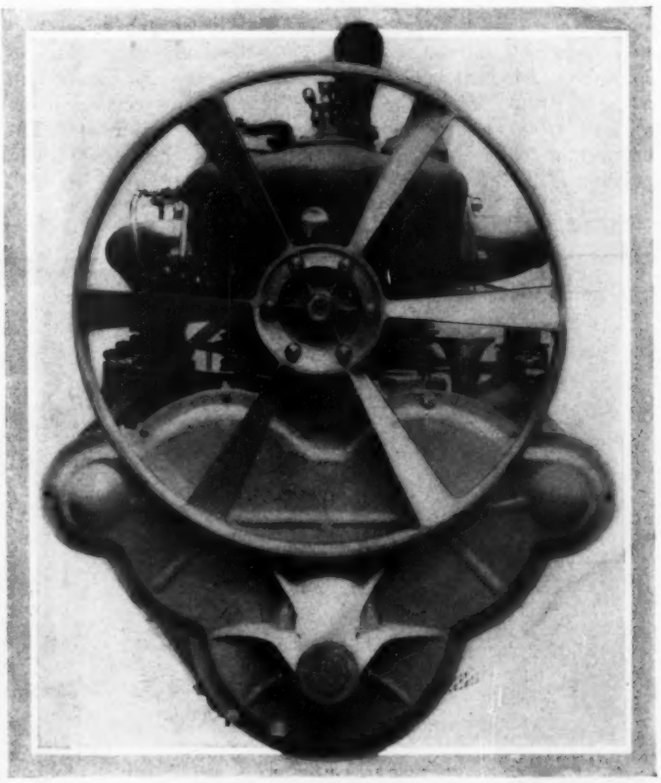
Newest Addition to Thomas Family Will Have Long Stroke—So it is that a new car has been added to the list of Thomases, a little "six," and this will be equipped with a long-stroke motor. The motor in detail is four-cycle, water-cooled, six cylinders, of 4 1-2-inch bore and 5 1-2-inch length of stroke. This gives a ratio of bore to stroke of 1 to 1.22, as compared with the 78 engines shown at the A. L. A. M. and A. M. C. M. A. shows in New York City last winter, which averaged but 1.14 for the value of this ratio.

The cylinders are cast in pairs, another departure from Thomas practice, and are exceedingly well water-jacketed. At the lower part of the cylinder the water-jacket is tapered to force more water to the top and hotter parts and less at the lower cooler portion. Moreover, the valves have been completely water-jacketed, and the stems of the valves are taken care of in the same thorough way. This prevents deformation of either valve seat or cylinder head.

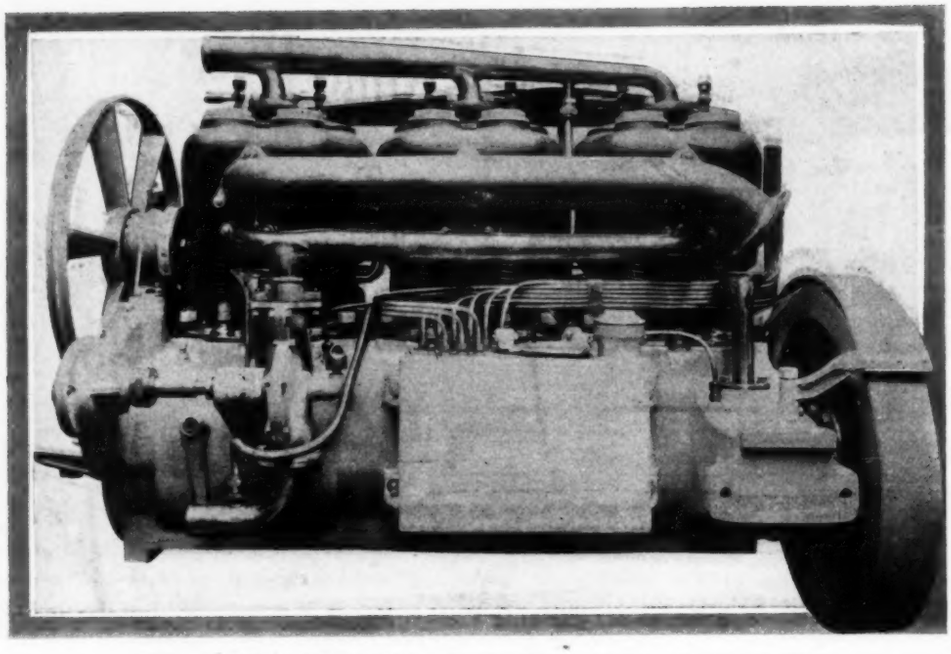
The cylinders are of what is known as the "Tee" head type; that is, they are symmetrical about the center line, the valves being located on opposite sides, inlet on the right and exhaust on the left. This form of construction lends itself well to the use of four bearings on the crankshaft, one at each end and one between each pair of cylinders.

Within the cylinders are placed the long pistons, with many rings. The length of the pistons is actually equal to the stroke, namely 5½ inches, and four narrow piston rings keep the cylinder heads gas tight. The connecting rod is also long, being more than twice the stroke length, that is, 11¾ inches.

Model M, as the newcomer is to be called, has been designed with a full knowledge of the latest foreign practice in large valves, big ports, and easy, smooth gas passages. The clear valve opening is 2¼ inches, or just half the diameter of the piston. The exhaust pipe is a casting of large internal diameter and easy bends; this, in combination with the large valves, serving to clear away the burned gases very quickly. The inlet manifold, on the other hand, is of drawn copper tubing, carefully built up to the required shape by brazing. This makes not only a serviceable job, but a fine appearance as well. When the speed at which



Motor as Seen from the Front Shows Symmetry



Exhaust Side of Model M Long-Stroke Motor, Showing Pump and Oiler

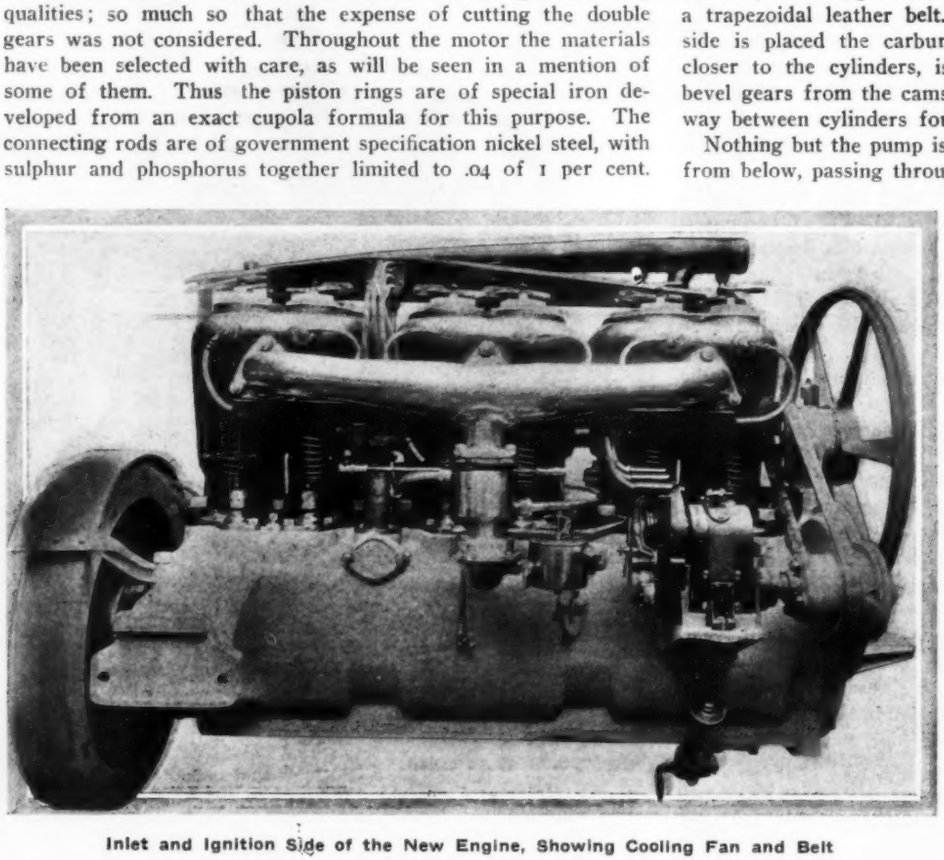
the gases travel in and out is mentioned—upward of three-quarters of a mile per minute—the importance of the size and proportions of the pipes will be appreciated.

Quietness Obtained in Many Places by Many Devices—One of the places where the noise has been reduced—and they are many—the valve plungers have been provided with fiber inserts, and the clearance reduced one-half of that ordinarily used. This combination makes an absolutely noiseless valve action. Another instance of this is in the gears for the camshaft. These are of steel and bronze, the camshaft gear being a pair of bronze helical gears, riveted together to form a single gear of herringbone tooth outline. This is well known for its quiet running qualities; so much so that the expense of cutting the double gears was not considered. Throughout the motor the materials have been selected with care, as will be seen in a mention of some of them. Thus the piston rings are of special iron developed from an exact cupola formula for this purpose. The connecting rods are of government specification nickel steel, with sulphur and phosphorus together limited to .04 of 1 per cent. The bolts are of nickel steel. Camshafts are of the same material, while all gears are either steel and hardened or of bronze. Flywheels are usually of cast iron, because it costs little, but the Model M flywheel is of cast steel, which is better adapted to withstand bursting strains. This makes it possible to use a larger diameter also, which is advantageous in the weight; the same weight placed farther from the center of rotation being much more effective, or, inversely, with the same effectiveness less weight may be used if it is located farther from the center.

The crankshaft, being the most important part of the engine, should be given the most care, and, in this case, it is. The material is a high grade of carbon steel, drop-forged and specially heat-treated by crankshaft specialists to bring out the best qualities.

Three-Point Suspension for Crankcase—One of the newest ideas as expressed in this engine is the three-point suspension incorporated in the crankcase. This case is a one-piece casting of aluminum, with two very wide strong feet at the rear and close to the flywheel. At the front the extended crankshaft bearing of the gear-case cover is machined to a circular form and is used for the forward point of support. The front gear cover, as is to be seen in the front view of the engine, is symmetrical about the center, the cam and auxiliary gears being located so as to balance. These shafts also locate the accessories, the shaft on the right side driving the magneto and the fan, while that on the left drives the centrifugal pump. Forward of the magneto, which is strapheld in place, is the pulley which drives the fan, this being of the six-bladed type with a rim, driven by a trapezoidal leather belt. Back of the magneto on the right side is placed the carbureter, and back of that, in turn, but closer to the cylinders, is the Unisparker. This is driven by bevel gears from the camshaft, and is located high up and midway between cylinders four and five.

Nothing but the pump is placed on the left, the water entering from below, passing through the pump directly upward into the tapered section copper pipe, which divides, one branch to the rear for cylinders five and six, and one forward for the other two cylinder blocks. The water outlet is on top of the cylinders, just off of center to the left, the compression relief cocks being located on the center. This pipe rises gradually to its greatest height just at the radiator connection, the section increasing at the same time, and in the same way.



Inlet and Ignition Side of the New Engine, Showing Cooling Fan and Belt

The bottom of the crankcase is closed by three handhole plates, these being ribbed to make them stiff, while being of very thin section and light metal, aluminum. The front one has a cored passage across the bottom, to the outer end of which is attached a cock and gauge glass. By reaching down and opening the cock, the oil rises in the glass to the same height as that within the case. If too low, more oil may be added through the vent pipes, of which there are two on the left side, the

rear one communicating with the interior through the hollow crankcase foot.

The oiler is fastened to the left side of the case, back of the pump, four bolts serving to make it practically an integral part of the case. From it about a dozen leads conduct the lubricant to the various parts which have forced lubrication.

Very Large, Liberal Bearings—Bearings interest everyone, for, no matter what else is right, if the bearings are not, it is dangerous to run the engine. On Model M the crankshaft is 1⅞ inch in diameter and provided with four bearings of a high grade of babbitt, die cast to insure absolute interchangeability. The total projected area of the four is 52.6 square inches. The same material is used for the big ends of the connecting rods, while on the camshafts bearing bronze is used. Each camshaft is provided with bearings which total 11.3 square inches projected area. This gives 22.6 square inches total for both shafts.

Perfect balance is obtained in two ways—every part is balanced on the ways for static balance; then, when completed and assembled, the units are tested for correct running balance. This constitutes the first part, while the second consists of machining the combustion chambers of the cylinder castings. Furthermore, these are measured and selected so as to match up, a set of six which exactly agree being selected for each engine. This care in balancing insures equal charges, equal explosions and equal expansions, all of which result in a quiet-running engine.

Double Ignition Features Show a Difference—It has come to be a trite saying that the motor is fitted with double ignition, two separate and distinct systems, so only the details of this one will be given. The two sources of current are a high tension magneto, Bosch, and the Atwater-Kent Unisparker for the second. The spark plugs for the latter are placed on the top of the cylinders, the wires being carried across the cylinder heads in an enclosed bus bar. The same method of procedure is carried out for the magneto, the plugs for which system are screwed into the side of the cylinders, projecting into the inlet valve pockets, as do also the other set. Among the little things worthy of mention is the ball and socket joint for operating the magneto, this being adjustable to very close limits.

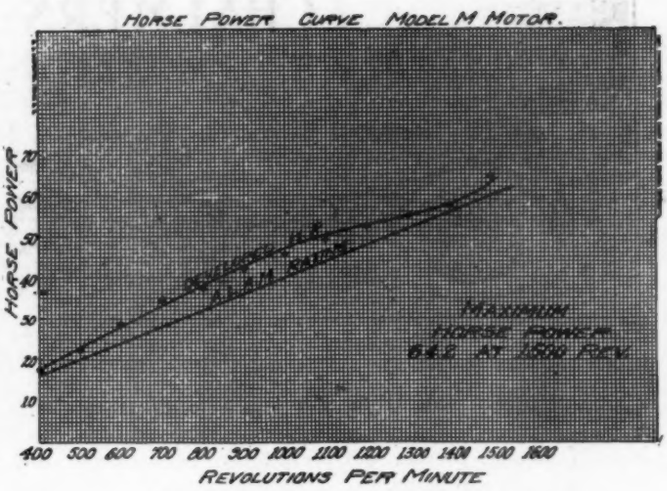
With this engine is used the three-disk clutch of which Thomas is the most consistent advocate. This is carried on two imported annular bearings, is provided with double adjustment, and is fitted with cork inserts. Back of the clutch and ahead of the transmission are placed two universal joints, of the internal gear type, which have stood up so well in motor truck service.

Transmission Shows Very Careful Designing—The gearbox is a very small, compact piece of mechanism. Some idea of the compactness may be obtained from the bare statement that the distance from center to center of the annular ball bearings, upon which the countershaft is mounted, is but 8 7-16 inches. Six of these bearings are used in all. The gears are of nickel steel, heat treated, hardened and quenched in oil. The net result of all this care in design and selection of material is that the complete gearbox weighs but 82 pounds.

In the rear axle Timken roller bearings are used throughout, the rear axle itself being a piece of Timken work. The axle casing is of pressed steel. Gears are of four pitch, and the gear ratio is three to one. In this axle the wheels are driven by jaw clutches at the outer extremities, the axle being known as of the full floating type.

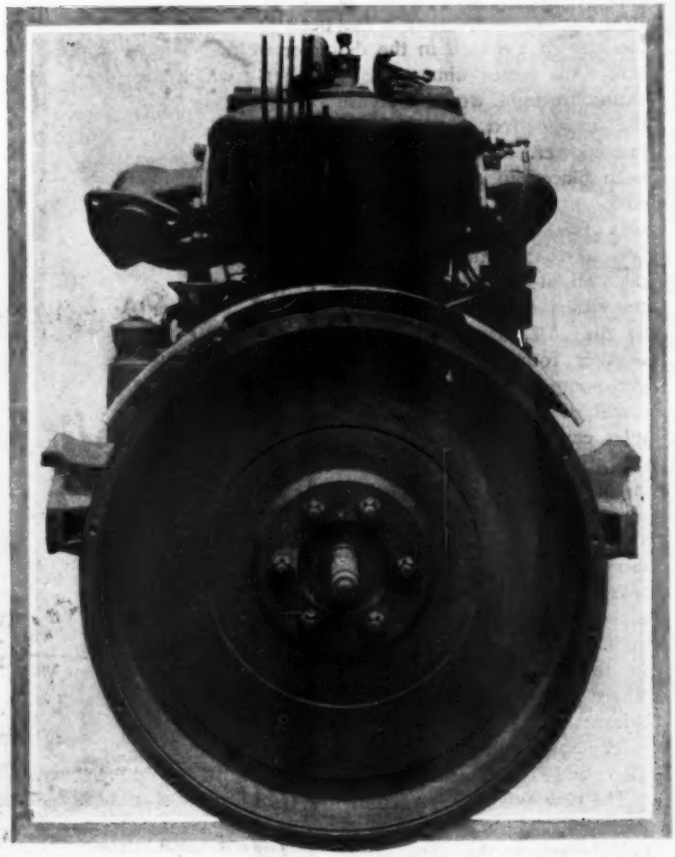
The front axle is a nickel steel I-section forging of large sectional area, as are also the knuckles and steering arms. The springs are of alloy steel, semi-elliptic being used in front, and three-quarter scroll elliptic in the rear.

Fenders and running boards, as well as the sheet-metal aprons, were the source of much attention to make the protection to the passenger perfect. The front fenders have a droop at the forward end which, together with the metal lip there fitted, prevent forward splashing, while a connection between fender and frame prevents side splash. The running board and the rearward extension of this connection eliminate danger from this source to the driver. At the rear, the same idea is well carried out by connecting the fender to the body or running board around its entire length.



Curve of Horsepower Obtained by Test

This Model M is made in six styles of body: touring car, runabout, tourabout, flyabout, limousine and landaulet. The open bodies are finished in royal blue with straw running gear, while the closed bodies are done in maroon with French gray, all being of hand-hammered aluminum construction. The touring car seats five and lists at $3,500, at which numerous extras are included. A few of these are: Speedometer, top, Prest-o-Lite tank, glass front, two oil side lights and tail light, robe rail, etc. The wheel base of the chassis is 125 inches and the tread standard. With full load of five passengers, all gasoline, oil and water tanks full, Model M has one horsepower A. L. A. M. rating for every 94 pounds weight. On the basis of the power the engine can develop, this is reduced to 50 pounds.



Rear View Displays to Advantage Flywheel Size

CHALMERS-DETROIT 1910 PRESENTATION

"Forty" Touring Car

"Forty" Roadster

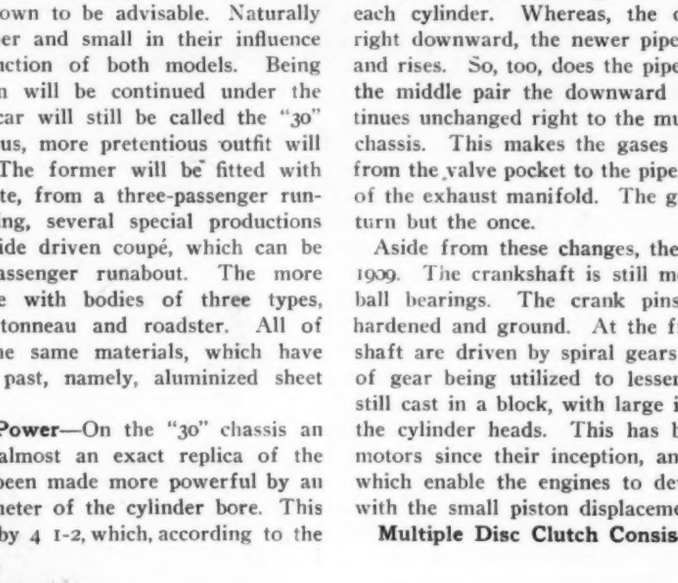
CONTINUED with slight and minor modifications, aptly describes the two models which the Chalmers-Detroit Motor Company, Detroit, will present for the season of 1910. These two cars will be the two made for 1909, with such alterations as a year's service has shown to be advisable. Naturally enough, these are few in number and small in their influence on the appearance and construction of both models. Being so little changed, both of them will be continued under the same name, that is, the small car will still be called the "30" and the larger, more commodious, more pretentious outfit will be continued as the "Forty." The former will be fitted with various bodies to suit every taste, from a three-passenger runabout to a five-passenger touring, several special productions being featured, such as the inside driven coupé, which can be instantly altered to a three-passenger runabout. The more powerful chassis will be made with bodies of three types, seven-passenger touring, pony tonneau and roadster. All of the bodies will be built of the same materials, which have proven so satisfactory in the past, namely, aluminized sheet steel and wood.

Larger Bore Means More Power—On the "30" chassis an engine will be used which is almost an exact replica of the 1909 engine, except that it has been made more powerful by an increase of 1-8 inch in the diameter of the cylinder bore. This makes the motor dimensions 4 by 4 1-2, which, according to the rating formula, would increase the power from 24 to 25.6 horsepower. The oil pump has been placed in a more accessible position. Whereas this was formerly placed in the bottom of the crankcase, in the oil well, it is now located on the exterior of the upper part of the case, opposite cylinder number four. A small plunger pump is driven from the camshaft of this cylinder, the inlet cam doing the work of operating the plunger. This is the prime mover in the circulating positive feed oiling system, which is otherwise retained complete. In this system the oil is pumped through a sight feed on the dash to the main bearings, whence it drips to the bottom of the case. There the collected pool of lubricant forms a splash system to cover the whole interior of the cylinders with a mist of oil.

The new exhaust pipe retains the admirable features of the old, including the very large diameters, easy bends, and other ideas which, combined with the big diameter exhaust valves, serve to clear the cylinders both quickly and effectively of the burned gases. The exhaust pipe itself, is, however, changed and now has individual leads from each cylinder. Whereas, the cylinder leads formerly started right downward, the newer pipe begins at number one cylinder and rises. So, too, does the pipe from number two, but between the middle pair the downward slope is commenced which continues unchanged right to the muffler, placed near the rear of the chassis. This makes the gases turn but one abrupt curve, that from the valve pocket to the pipe, and one easy one, in the middle of the exhaust manifold. The gases from the two rear cylinders turn but the once.

Aside from these changes, the motor is identical with that of 1909. The crankshaft is still mounted upon two large diameter ball bearings. The crank pins are 2 1-4 inches in diameter, hardened and ground. At the front, the camshaft and auxiliary shaft are driven by spiral gears from the crankshaft, this form of gear being utilized to lessen the noise. The cylinders are still cast in a block, with large inlet valves located in the top of the cylinder heads. This has been a feature of the Chalmers motors since their inception, and has been one of the features which enable the engines to develop so much power compared with the small piston displacement.

Multiple Disc Clutch Consists of Steel and Bronze Plates—The clutch is another part which is retained without change. This, it will be remembered, consists of alternate steel and bronze plates, the latter being connected to the flywheel and the former to the main driving shaft through the medium of keys. Three sets of spiral springs are used, equally spaced around the periphery. These are of small diameter and medium size wire, so that the pressure necessary to declutch is very small. Like all disc clutches, this one runs in a bath of oil, resulting in the gradual engagement of the clutch when the pedal is freed and the springs allowed to press the plates together.



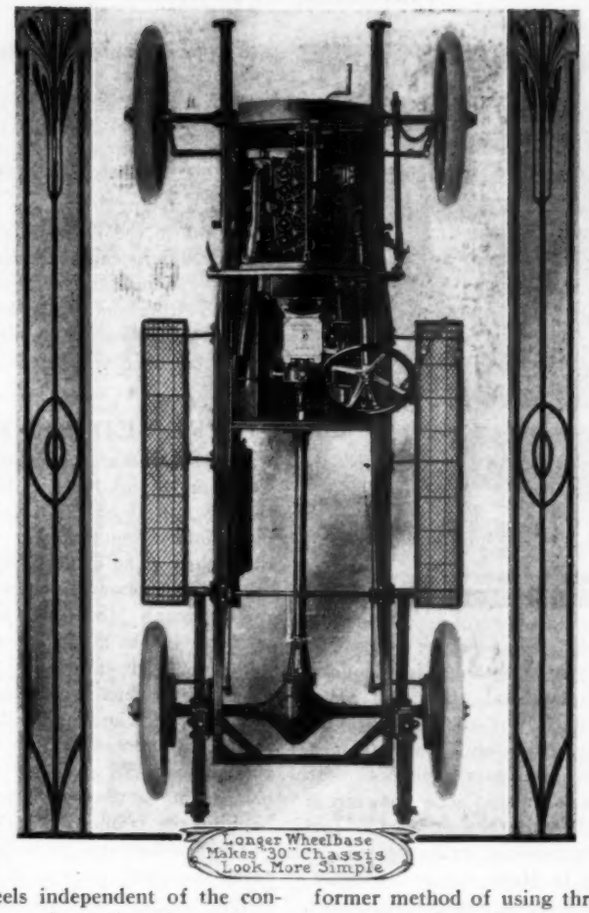
Rear Motor Showing Transmission Brake

Rear View Displays to Advantage Flywheel Size

Unit power plant construction is another Chalmers idea which needs little explanation or description. The transmission is a unit bolted up to the rear of the engine base and carries the clutch within it. The three speeds and reverse operate selectively. Transmis-

sion bearings are all of the annular ball type, while the gears are of chrome nickel steel, carefully heat treated. The teeth are of large pitch and mechanically chamfered to render gear shifting easy. The shafts are of alloy steel and the gears are arranged upon them in as compact a manner as possible. This makes a small but very strong and stiff transmission case.

Brake Arrangement—Following the usual Chalmers practice, one transmission brake is provided immediately behind the gear case actuated by a foot pedal. A pair of internal expanding brakes operated from a side lever are placed directly on the rear wheels. The placing of the foot brake on the transmission has a number of advantages, among which may be mentioned: The increased braking power owing to the drum being geared up from the wheels; simplicity; cleanliness; obviation of clogging of braking toggles which occurs in the inside brakes mounted on the wheels; the removal of all superfluous weight from the axle, this being distributed over four wheels, and the consequent saving in tire wear; complete equalization of braking effort between the two wheels independent of the condition of the braking or road surfaces. As against these advantages, only one imaginary disadvantage can be cited, and that is the transmission of the braking effort through the rear axle driving mechanism. However, this mechanism must be amply strong to allow the motor slipping the rear wheels under all condition of load and road surfaces. The braking effort can't possibly exceed this. In fact it must always remain somewhat less. A brake placed on the transmission can therefore never strain the driving mechanism quite as much as the motor itself is capable of doing.

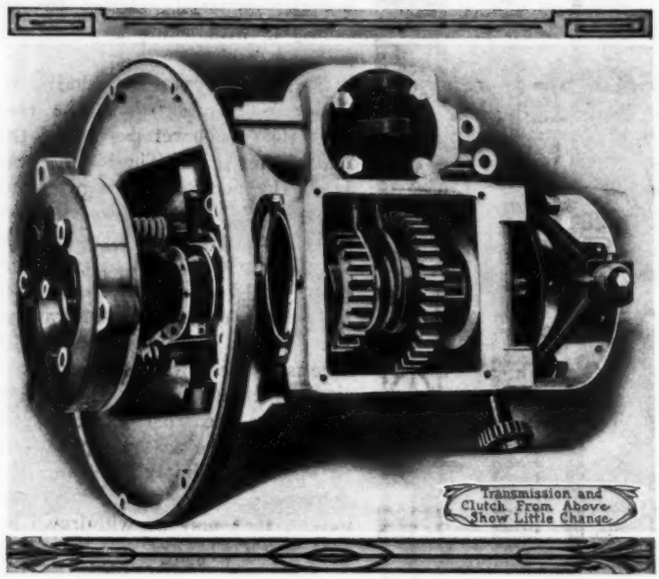


Details of the Final Drive—Directly back of the transmission and brake drum is placed the first and only universal joint. This is bushed with removable steel bushings and is enclosed in a metal case to keep lubricant in and dirt out. At this point is attached the forward end of the torsion sleeve, which surrounds the nickel steel driving shaft, and is bolted at the rear end to the axle casing. This sleeve renders unnecessary the usual torque rod and radius rods as well. It takes both driving and braking strains, while insuring rear axle alignment at the same time. Needless to say that it is of a very superior material, selected for its ability to withstand just such complicated strains.

From the propeller shaft the power is transmitted to the rear axle through bevel gears and the usual differential. The balance gear is of the bevel type, four pinions being used. This is very compact and the construction of the housing or case for it is such as to permit of its ready removal by simply taking off the cover and withdrawing the axles far enough to free it. The axle is of the full floating construction, which means that the weight of the car is carried on the sleeves surrounding the axles proper. The latter, then, simply transmit the power. Since they do not carry any weight, they may be withdrawn at will and while the car is standing on the wheels. This is effected by making the axles with six jaw clutches at the ends, which clutches do the driving. By taking off the hub caps, these are exposed to view and may be drawn out without the necessity for any tools. The construction of the axle tubing and differential housing has been improved by making the housing and tubes in one piece instead of the former method of using three pieces, riveted together. The new case tapers from the largest part of the balance gear out to the ends, which results in a very pleasing outline and strengthens the whole at the same time. Annular ball bearings are used on the axles, while the axle itself is of 3 1-2 per cent nickel steel, heat treated. The spring seats swivel upon the axle tube, which avoids twisting the springs, when obstructions are met that strain the two sides of the frame differently.

Steering and Larger Tires Conclude the Alterations—While the steering gear remains as before, the shifting or operating mechanism has been improved by enclosing it in separate casings. All steering parts are stout forgings, no castings being used on these important parts. The cross rod is behind the front axle and the reach rod above it, both being so placed for protection of these vital details. Steering arms are provided with bosses for the ready attachment of speedometers. Front wheels run on ball bearings and are fitted with larger wheels and tires. The wheels have been increased to 34-inch to improve the riding qualities, while 3 1-2-inch tires are fitted on four wheels.

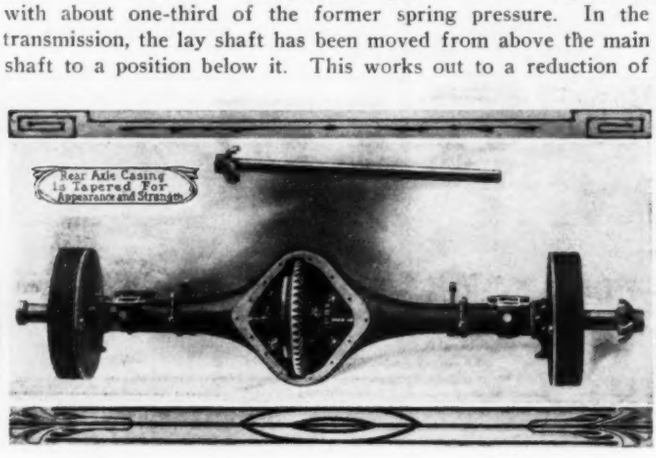
The frame, which is of pressed steel, shows one or two minor changes, as back of the front seat



location it has been dropped in order to lower the rear floor boards, while a lower center of gravity is obtained incidentally. This section has been increased at the bend, the extra metal tapering gradually back to the very end of the frame. This extra metal is provided in both the upper and lower flanges, materially stiffening the frame. The section is a channel with the open side turned in toward the mechanism. The upsweep at the rear end is retained unchanged despite the additional forward drop just at the point where the tonneau entrance comes.

What the "Forty" Reveals That Is New—Generally speaking, the "Forty" shows a lesser number of changes than does the smaller car. These include a longer wheelbase, which results in a more commodious body; a change of position of the lay shaft in the transmission; ball bearings for the latter instead of the taper rollers of last season, heavier and stiffer frame; honeycomb radiator in place of vertical tube; and triangular torque rod consisting of two tubes, radiating from the front point of attachment to the axle casing. This last takes the place of the single tube formerly used, and gives increased stiffness and strength. The wheelbase shows a real change, the new figures being 122 inches as compared with the former figure of 112, an increase of ten inches, all of which is put into the tonneau or rear part of the body. This permits of making the capacity of the car seven passengers instead of five.

The same engine is used, 5-inch bore by 4 3-4-inch stroke, rated at 40 horsepower, according to formula. The valve sizes and location are unchanged, all being on the right side, in pockets. The crankshaft still has three bearings of good length and the material, die cast tin-babbitt. Oiling is the same. Like the motor, the clutch is unchanged, although the operating means is. This latter has been so changed as to permit of clutch operation with about one-third of the former spring pressure. In the transmission, the lay shaft has been moved from above the main shaft to a position below it. This works out to a reduction of



the angle of the driving shaft, even with the larger wheels. The latter are now 36-inch in diameter, equipped with 4-inch tires all around. The rear axle will be of pressed steel, autogenously welded along the neutral axis, giving the greatest possible amount of strength for its weight.

The changed torque rod is worthy of more than passing mention. A triangular shape set on one flat side and presenting the point to the deforming force is the strongest shape known. The Chalmers engineers have taken advantage of this fact and have so shaped and set the torque rod that it has a triangular shape resting on a flat base at the rear end and presents a point, the forward end, to the deforming stresses, which tend to rotate the rear axle as the rotation of the engine shaft.

IMPROVED 1910 KISSELKARS ANNOUNCED

HARTFORD, WIS., Aug. 16—The factory of the Kissel Motor Car Company of this city has begun preparations for turning out the new series of Kisselkars, which, it is announced, will show many interesting changes. The publication of the 1910 specifications among the dealers has met a warm response and in consequence the factory expects a big demand.

This year's Model D-9 will be continued with slight changes as next year's Model D-10. It will, however, be rated at 50 horsepower instead of 40, though the refinements or increased dimensions which give this greater power have not been published. The wheelbase will be lengthened to 120 inches and the seating accommodations of the car will be made roomier. The change-gear will give four speeds instead of three. A great improvement in the appearance of the car has been effected by hanging the frame two inches lower. The price will be $2,000.

The smaller car, to be known as Model LD-10, will be built along the same lines as this year's 30-horsepower car, and will sell for $1,500. The wheelbase will be lengthened to 112 inches and the body will be altered to provide wider rear seats and more room forward of the front seats and in the tonneau. The general appearance of the car will be much the same as Model D-10. The body has been hung about three inches lower than formerly. This model will have double internal brakes, 34-inch wheels, and will be made both as a touring car and as a baby tonneau.

For those who wish a car of medium power but of ample capacity the new Model F-10 has been provided. This will be of 50 horsepower, seven-passenger, 124-inch wheelbase, and will sell for $2,500. It will also be built as a baby tonneau with 40-inch wheels. The adoption of this large size is another sign of the times, and doubtless before another year all makers of large cars will follow suit. There can be no doubt of the superiority of these large wheels over the old sizes from the users' point of view, as the cars equipped with them are much easier riding and also a shade faster. Last and largest of the Kissel line is Model G-10, the six-cylinder, 60-horsepower car, with practically the same features as the smaller models.

ADVANCE NOTES OF THE 1910 PULLMAN

YORK, PA., Aug. 16—The York Motor Car Company reports that it is turning out large quantities of Pullman cars and that it is making contracts so rapidly that its contemplated 1910 output of 2,000 cars will probably be completely allotted by the middle of September. The new model shows many improvements on previous ones. The power has been increased from 30 to 35 horsepower by lengthening the stroke from 4 1-2 to 4 3-4 inches. The radiator has been made correspondingly larger. A full floating type of rear axle is now used, with a double set of equalized brakes. The wheelbase has been increased by five inches, being now 112 inches, and the car as a whole is more richly finished than formerly.

Two Pullmans have been entered in the Munsey reliability contest to be run next month. The route lies through York, and the York Company has been constituted a reception committee in behalf of the city. The tourists will be supplied with lunch boxes as they pass through.

What the Clubs Are Doing These Days

HUGUENOTS TO HAVE AUTOMOBILE CLUB

NEW ROCHELLE, N. Y., Aug. 16—The reasons for the organization of an automobile club are so explicitly and convincingly set forth in a letter issued in connection with the formation of a club in this place, that its reading may be beneficial in other cities where the same conditions exist, requiring the attention of automobilists.

Herewith is the call sent out by E. T. Birdsall, well known since the introduction of automobiling in this country:

New Rochelle, August 12, 1909.

HUGUENOT MOTOR CLUB

Dear Sir:

In consequence of the large number of automobiles owned in the City of New Rochelle and vicinity, and in view of the bad condition of the pavements of the streets and other conditions which make the operation of our cars more or less of a burden instead of a pleasure, it is believed that the time for the organization of a strong and influential motor club has arrived.

The benefits that can be secured by a strong and determined effort on the part of a club are many. Individual efforts, no matter how well directed or energetic, never have the weight of those of a well organized body. It is the old story of "United we stand, divided we fall," or, to fit this case, "United we win, divided we fail."

In addition to the material benefits there are those of a social, technical, and sporting character, interchange of ideas and experiences, legal help when in trouble, and many others that will at once suggest themselves.

It is proposed to begin in a small way at first, only expanding as the growth of the club warrants. Mount Vernon has a good club with a fine house. New Rochelle can surely do better.

With several hundred owners in the city we should be able to start with at least fifty charter members.

The meeting for organization will be held in the hall of the Republican Club on Church street, at 8 o'clock, P. M., Thursday, August 19.

If for any reason you cannot attend, drop me a line saying that you are in favor of the scheme and will join the club.

Don't put it off, do it now!

Yours very truly,
E. T. BIRDSALL.

SECOND LARGEST IN PENNSYLVANIA

MEDIA, PA., Aug. 2—The monthly report of President Weeks shows that the Automobile Club of Delaware County is now the second, numerically, in the State of Pennsylvania, having 357 names on its membership roll. The clubhouse bee is now buzzing loudly, and President Weeks has appointed a committee to decide on plans and select a site.

A touring information bureau has been established for the use of the members.

NORRISTOWNERS GIVE A TIME TO ORPHANS

NORRISTOWN, PA., Aug. 16—One Friday recently four hundred little children of this town were given the time of their lives by the Norristown Automobile Club. Sixty-two cars were donated to the committee having the affair in charge. The little ones, after a 90-minute dash through the country to Willow Grove, reveled in the delights of that place for nearly three hours. After luncheon in the grove, and listening to Victor Herbert's orchestra, the tired but happy bunch of youngsters were whisked back to their homes in the evening.

ANNUAL RUN OF THE ROCHESTER CLUB

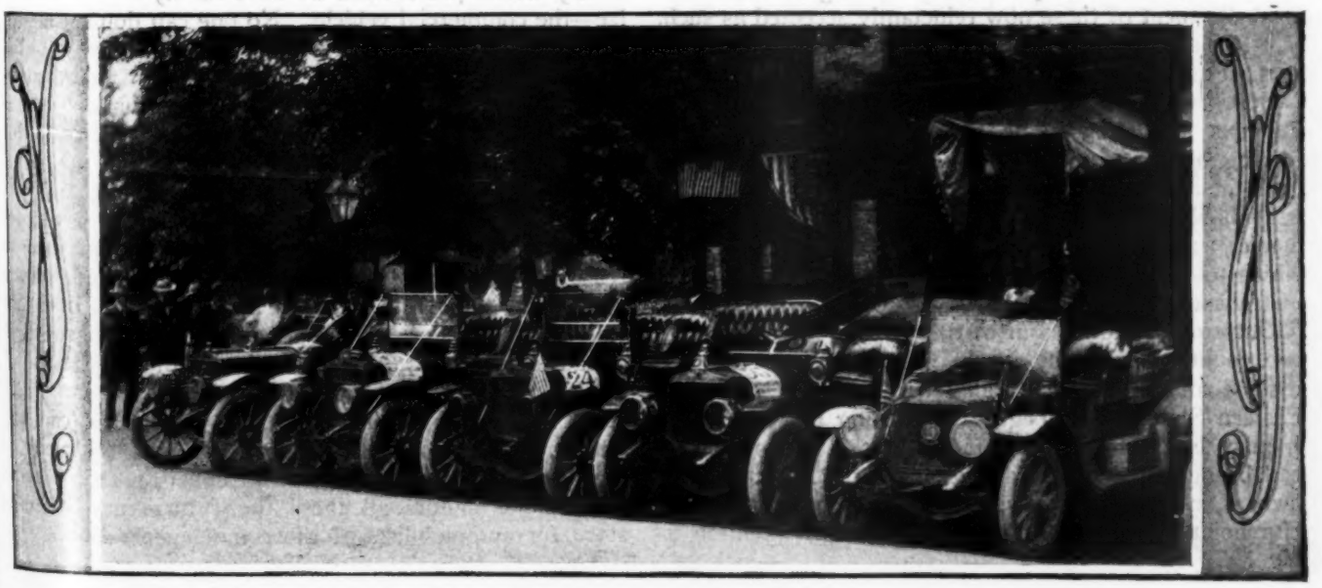
ROCHESTER, N. Y., Aug. 16—Twenty or more automobiles turned out for the annual run of the local automobile club, and some three-score members had a most enjoyable outing. The run lasted a week, and took the participants through the lake region of central New York. Historic Watkins Glen and many other points of interest were visited. The photograph shows the cars parked at Lima, N. Y., and it will be noticed that the Seldens made in this city are much in evidence.

MACON, GA., OWNERS WANT A CLUB

MACON, GA., Aug. 16—With over 250 automobile owners in this city, there is every probability that an automobile club will be formed at an early date. A number of the autoists have joined in a voluntary committee to secure an organization which will be a power locally for good roads. One man has offered a suitable tract of ground for a country clubhouse, about twelve miles out on one of the best roads.

CINCINNATI CLUB PLANS RACE MEET

CINCINNATI, Aug. 16—There will be an auto day at Coney Island on August 22, when the Cincinnati Automobile Club will hold a series of track contests. The organization has started out to make this the biggest event of its kind on the local track, and five races are on the program. There will also be a chance given for dealers to exhibit the new models of cars and accessories.



Recent Run of the Rochester (N. Y.) Automobile Club, in Which the Local Made Selden Cars Were Much in Evidence

THE AUTOMOBILE

Vol. XXI Thursday, August 19, 1909 No. 8

THE CLASS JOURNAL COMPANY

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A. B. SWETLAND, General Manager

231-241 West 39th Street, New York City

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GERMANY:—A. Seydel, Mohrenstrasse 9, Berlin.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

GROWTH IS A MATTER OF ROADS

The automobile being a pleasurable necessity, its use is made more general by the existence of good roads. But even with roads not deserving of the name, it is still a necessity. Hence its greater use is inevitable under any circumstances. With the knowledge that real roads breed automobile owners, it is wise foresight on the part of those interested in the progress of the industry to aid, as far as lies in their power, the building of roads and the betterment of those now reluctantly accepted as such.

When all interested in this enormous work are organized so as to concentrate their influence and votes, the rapidity with which the movement will go forward will be most surprising. The reason has its basis in the coming of the automobile, which continually advertises itself in abridging distances economically. The vehicle is available, but to make it available to the greatest economical extent it must have the right kind of a road over which to demonstrate its superiority over previous kinds of transport.

During the Glidden tour of this year, in crossing Iowa, one county, Greene by name, was discovered to have roads that compared favorably with many highways in Eastern States which began roadmaking ten years ago. Inquiry brought forth the fact that this roads interest had brought in its train an increase of fifty automobile owners in a town of twenty-five hundred inhabitants. Humboldt county, in the same State, called attention to its roads when the A.A.A tourists entered its confines. Previously in Wisconsin, not far from Madison, a town called Baraboo supplied roads built by itself, which were the joy of the trophy-chasers, who were perhaps too much inclined to rate the worth of a State, county, or township by the kind of roads supplied to the tour.

Michigan was put down as mostly absolutely bad; Illinois was only slightly sampled with indifferent results; Wisconsin did fairly well; Minnesota, not being tackled during the rainy season, escaped with some credit and more doubt as to what would have happened if a hard downpour had interposed; Iowa created some pleasurable surprise; not much was expected of Nebraska; Colorado is awakening in the matter of roads; and Kansas was passed through at a favorable season.

Some day there will be only one kind of traffic on the roads, and then they will not wear out so quickly. When the horse goes to his well-earned rest the motor-driven vehicle will have the road to itself; and it has been proven that a highway for autos exclusively does not succumb to traffic with any such rapid disintegration as does the present road harassed by two antagonistic forms of usage, the antiquated form of which is bound to disappear.

But the horse is certain to be with us for some time yet, and therefore it is up to our roadmakers to invent a highway that will better withstand the conditions under which it must labor in the next few years.

NEED OF ECONOMICAL OPERATION

Automobile manufacturers, in their desire to outstrip one another in offering the public models bigger and better than any ever before made, have too often lost sight of the fact that, after all, the most generally desirable feature of any car is economy. True, there are thousands of men who will pay any price for speed and appearance, and these have been most in evidence as buyers in the past; but there are thousands of men who must count their pennies, and these are the waiting buyers of the future. Perhaps a score of makers can find room for their product in the high-priced market; the great majority, however, must rely on the patronage of farmers and business men of moderate means.

Then there is that great branch of the automobile industry whose possibilities we have hardly begun to realize—the commercial vehicle. No one can doubt that the time will come when horses will not be allowed within the limits of large cities, much less be stabled there; automobile trucks and delivery wagons will handle everything, from the lightest to the heaviest traffic. In this field economy is the pre-eminent requirement.

The need of economy is the last and greatest, and perhaps the most difficult, of the problems which have confronted automobile designers. Power and endurance, in reasonable measure, have already been obtained. Even more than these, the question of economy is one that calls above all for skill in design. Much progress has already been made; the long-stroke motor and the use of anti-friction bearings and large wheels are important steps in advance. What steps yet remain we can but guess. The use of some cheaper fuel, possibly alcohol; the discovery of a substitute for rubber; perhaps, even, the turbine motor—all these the future may have in store for automobilists of the coming generation.

CONTAINED IN CONNECTICUT'S NEW AUTOMOBILE LAW

HARTFORD, CONN., Aug. 16—Nutmeg State automobilists and their touring visitors from other commonwealths are now subject to a new automobile law. An increased system of registration fees and a tax of $2 an each engine produced by a manufacturer and tested upon the roads, are the chief alterations over the enactment now in force. The speed law and non-resident clause remain the same, the former requiring a speed reasonable with regard to traffic, and making 25 miles per hour, for one-eighth of a mile, evidence of reckless driving. Tourists are given ten days each year in which they may use the highways of the State without taking out a license. In spite of the influence brought to bear upon Governor Weeks by the Connecticut State Automobile Association and individual autoists, he signed the bill with certain amendments required.

Chief opposition was centered against the increased fees, which are considered burdensome. Otherwise the main points of the law are as before, such as prohibiting local ordinances except in parks, but inserting the 10-mile an hour provision in regard to streets of incorporated cities. The law also states that cars must not proceed at a speed faster than three miles an hour when approaching trolley cars which are receiving or discharging passengers on the same side. Governor Weeks desires that autos be required to stop on such occasions.

Classification will be by the A. L. A. M. formula in determining the horsepower of gasoline-driven cars, and manufacturers' catalogues in regard to steam and electric vehicles. A definite schedule has been set down, although the Governor desires a rate calculated at 60 cents per horsepower. The following is the list:

Cars of less than 20 horsepower, $6; 20 to 29 horsepower, inclusive, $10; 30 to 34 horsepower, $15; 35 to 39 horsepower, $20; 40 horsepower and over, $30; liverymen, each car, $10; trucks and other commercial vehicles, $5; motorcycles, $1; dealers, each car, $20; factory engines tested or operated upon the roads, each $2; operator's license, $2.

The registration fees for the cars expire on December 31 of each year, and the license for the individual on the last day of each February. The act goes into effect on September 1, but it is understood that those already having licenses and registration under the present law will not be required to take out new ones until the first of January.

Clauses have been introduced to prevent tampering with cars without the knowledge of the owners; and fines for anyone who operates while under the influence of liquor, for trying to make a record, or for racing. Sixteen years of age is set as the minimum for licenses, and the Secretary of the State has power to revoke licenses for reckless driving or other sufficient reasons.

On the whole, the law has many good points.

MASSACHUSETTS BUSY THIS WEEK TAKING ROAD CENSUS

BOSTON, Aug. 17—Beginning Sunday morning at 7 o'clock, and to continue this week, the Massachusetts Highway Commission is taking the most comprehensive road census ever undertaken in this country. The plans that have been made call for a count of the vehicles using the State roads for fourteen hours each day during the week at more than 200 stations scattered all over the State, with a twenty-four hour count at eleven stations on the principal through routes of travel. This count, which is to be made in the period of heaviest tourist traffic, will be supplemented by another week's census in October.

From time to time in the office of the Highway Commission questions have arisen as to the relative amount of traffic on State roads in different sections, and its bearing on maintenance costs, and the commission never has had any accurate data upon which to base its estimates. In its announcement the commission says the road census is undertaken "first, to determine the relative importance of the different lines or routes of travel throughout the State," and "second, to secure at least a rough approximation of the relative use of such routes by motor vehicles and by horse-drawn vehicles."

The observers, principally boys and girls from the schools, were selected by the chief engineers of the five divisions into which the State roads were divided. They will be on duty every day from 7 a. m. until 9 p. m., and with the exception of motorcycles, bicycles, pedestrians and cattle, will make note of all traffic movements by their stations. They will be provided with cards for each day.

The stations at which a twenty-four hour watch will be made are on the roads between Boston and Lynn, Medford, Lawrence, Marlboro, Providence, Lowell, Lexington and Concord, Beverly and Gloucester, and Beverly and Newburyport. In addition an effort is being made to have simultaneous censuses taken by the Metropolitan Park Commission on Parkways in Revere, Saugus and Medford by the Boston Park Commission on Commonwealth avenue and by the Newton authorities on the Newton boulevard. If this is done some important results in the relation of traffic and cost of maintenance under different conditions are expected.

This is believed to be the first time a complete State road census has been undertaken in this country, and much valuable data not only for Massachusetts but other places is confidently expected to result from the count.

PLANS FOR LONG ISLAND MOTOR DERBY

NEW YORK, Aug. 16—Over on Long Island, and in the headquarters of the Motor Contest Association in this city, plans are maturing for the Long Island Motor Derby. This event is planned to take place September 21, over a 22-mile circuit having Riverhead and Mattituck as prominent points. Senator W. J. Morgan last week took Ralph DePalma over the course, and this well-known driver declared his belief that the roads would prove both fast and safe. As laid out at present, the route leads from Mattituck to Riverhead in a straight line, with one turn two miles from the latter place, so that there are two 10-mile stretches without a turn. There are but three deviations in the entire round, and none of these is bad as compared with most courses. Starting at Riverhead the towns passed through are: Jamesport, Mattituck, Northville and Centerville.

GOOD ROADS NEAR NATIONAL CAPITAL

WASHINGTON, D. C., Aug. 14—As the result of a good roads rally in Alexandria, Va., Thursday night, the Alexandria-Washington Highway Association was formed for the purpose of securing the construction of a macadam road between the two cities. A tentative plan for the construction of the road, prepared by Charles H. Hoyt, a road engineer from the office of public roads, Department of Agriculture, was submitted. The meeting was attended by several hundred representative men of the two cities. About 25 cars took the Washington delegation over to George Washington's home city, and all who made the trip had a practical demonstration of the great need of improving the road connecting the two cities. The proposed improvement in this road will be the first step in the work of securing a boulevard between Washington and Mount Vernon.

JEWEL NOW CROXTON-KEETON COMPANY

MASSILLON, O., Aug. 16—The Jewel Motor Car Company, of this city, will in the future be known as the Croxton-Keeton Motor Company, with a capitalization increased from $250,000 to $500,000. H. A. Croxton, whose name now appears in the designation of the company, will continue in his former position of president and treasurer. He is also connected with the Massillon Iron & Steel Company, the Massillon Bridge & Structural Company and the Massillon Foundry & Machine Company, and has been designing and constructing machinery and machine tools for the past fifteen years. F. M. Keeton has been in the automobile business for ten years, serving in various capacities with the Pope-Toledo and De Luxe companies, and for the past two years has been making a close study of the taxicab situation.

For 1910 the Croxton-Keeton line will consist of eight models, built on three chassis of 30, 45 and 60 horse-power. The 45-horse-power cars will be practically duplicates of the two Jewel cars which passed creditably in the Glidden tour. The smaller chassis will be particularly adapted to town-car use, and may possibly be built as a taxicab.

The Croxton-Keeton Company will produce 600 cars in 1910. It has purchased the factory which it has leased for the past three years, and, although the capacity has already been doubled, is designing another additional building 160 by 380 feet, of saw-tooth construction. Work will be begun during the next month. The company has also secured an option on seven acres of ground across the street from the present factory for future enlargements. Distributing branches have already been established in New York, Pittsburgh, Pa., Cleveland, Chicago and Boston, and in the near future Minneapolis, Minn.; Kansas City, Mo.; Portland, Ore.; San Francisco, and Atlanta, Ga., will also be covered. The car made by the Croxton-Keeton Company will be known as the Croxton-Keeton, instead of the Jewel.

COMMERCIAL CARS USED IN INDIANAPOLIS

During the present season the commercial side of the automobile has been given much attention in Indianapolis, and it is estimated that 25 per cent. of the city's delivery work is accomplished by automobiles. Within the last few months the collection of milk by means of gasoline cars has gained great headway. One company is now operating two trucks in this work, covering the country within a radius of twenty miles. Much better time is made in this way than by the interurban cars. Another company operates a truck between Indianapolis and Plainfield, making one round trip a day. The route is through a rich farming district, and much milk and other produce is handled. Still a third line runs to Smith's Valley, Glenn Valley and Waverly.

AMERICAN SIMPLEX NEEDS MORE ROOM

MISHAWAKA, IND., Aug. 16—The American Simplex Motor Car Company of this city has completed plans for a 172 by 240-foot addition to its plant, to be built of brick and concrete. The new structure will be a duplicate of the one at present occupied, thus doubling the capacity of the plant. This move was decided on at a recent meeting of the stockholders. Work will be rushed, as the additional space is badly needed to assist in putting out the cars which the company has already contracted to deliver. The design of the 1910 cars has been completed, and nearly the entire output has been disposed of to agents.

RIDER-LEWIS OCCUPIES NEW FACTORY

ANDERSON, IND., Aug. 16—The Rider-Lewis Motor Car Company has occupied its new factory at this city and has begun to turn out its 1910 product, which was described recently in THE AUTOMOBILE. The first of the 1910 cars appeared in the streets within fifteen days after the occupation of the plant, and work will be continued in the same energetic way.

OAKLAND TO GREATLY INCREASE OUTPUT

DETROIT, Aug. 16—The Oakland Motor Car Company, at Pontiac, is the latest to get caught in the wave of prosperity sweeping over the automobile industry. So great has been the demand for Oakland cars that announcement is made of changes whereby the company's manufacturing facilities will be increased to 12,000 cars a year. The property of the Pontiac Buggy Company has been acquired, and, in addition, several large buildings will be erected, giving a greatly increased capacity.

For 1910 the Oakland Motor Car Company will put on the market a new model, to be known as the Oakland "30." It will have a 100-inch wheelbase with a four-cylinder 4 by 4-inch motor, developing approximately 30 horsepower. The car will be made in two styles, touring car and runabout. The Oakland "40," which has proved so popular, will be continued, 3,000 of this style being manufactured in touring-car, runabout and toy-tonneau styles.

ALUMINUM COMPANY IN COMBINATION

SYRACUSE, N. Y., Aug. 16—One of the largest transactions ever made in a trade affecting the automobile industry has been executed by the Aluminum Castings Company. This concern has acquired the property and business of the following firms: The Allyne Brass Foundry Company of Ohio, the Allyne Brass Foundry Company of Michigan, the Allyne Brass Foundry Company of New York, the Syracuse Aluminum and Bronze Company, the Eclipse Foundry Company and the foundry department of the United States Aluminum Company. It is the announced intention of the Aluminum Castings Company to continue these plants under the present management and with the same attention to details as heretofore. They will be equipped with improved appliances, and particular attention will be paid to the scientific and technical features of the business.

OVERLAND MAKES A BIG AGENCY DEAL

Charles E. Riess & Son, of East Orange, N. J., signed an agreement last week to take the metropolitan agency for the Overland and Marion, and contracted for 1,500 cars for the coming year. The territory of the new agency will include Greater New York City and Long Island, extending as far north as Poughkeepsie. Salesrooms and a garage will be opened in the building at present occupied by the Stoddard-Dayton agency, at Broadway and Fifty-seventh street. Although a newcomer to automobile row, Mr. Riess has had the New Jersey agency for the Overland and Marion for the past two years. The Overland Company has already contracted with its agents for the delivery of 14,500 cars during 1910.

WINCHESTER ARMS CO. TO ENTER FIELD

NEW HAVEN, CONN., Aug. 16—With the enlargement of the charter of the Winchester Repeating Arms Company comes the announcement that the concern will soon enter the ranks of automobile manufacturers. It is expected that work in this direction will not be started much before the completion, within the next six months, of two large concrete buildings. Heretofore the charter of the company would not have permitted it to construct autos, but the legislature has removed the obstacles. In view of the Winchester Company's experience and reputation, further announcement of its plans will be awaited with interest.

WILL BRING OUT NEW GASOLINE MOTOR

SOUTH BEND, IND., Aug. 16—At the annual meeting of the stockholders of the Wood Electric and Manufacturing Company the following officers were elected: W. E. Wood, president; D. M. Wood, vice-president; W. G. Crabill, secretary; C. H. Harper, treasurer. The company has perfected a gasoline motor that is attracting considerable attention and comment from the trade. The capital stock of the company has been increased to $50,000.

RIKER DISCUSSES TENDENCIES IN RACING AND DESIGN

BRIDGEPORT, CONN., Aug. 16—Automobile racing, tendencies in 1910 design, and constructive features of new models are pertinent subjects out at the big plant of the Locomobile Company of America. The cars for the approaching season are well under way, and the new buildings are now up to the second floor, so that before long a great increase in capacity will result. It is interesting to know the opinion of this concern in regard to the points chiefly concerning automobilists, as discussed by A. L. Riker, the chief engineer, and a well-known authority on these matters.

Mr. Riker says: "It seems to us that automobile racing has had its day as far as manufacturers are concerned. The support of the makers is not likely to continue much longer, for the expense is too great and the returns often too small. The races have shown the makers how to build better, stronger, and, at the same time, lighter touring cars, and there seems to be little left to discover in that line. From a sporting standpoint it is likely that automobile racing will continue, as handled by promoters, for this manner of amusement is evidently very popular. Perhaps regular circuits will take the place of the present events here and there, aand those backing them will have several makes of cars. As to the action of the Locomobile Company with regard to the fall stock car races, it is problematical as to whether we shall enter, the matter has not been definitely decided one way or the other. Our inclination, however, is to withdraw from participation in the contests, as we see nothing to be gained by them, and they just upset factory routine.

"There is really greater activity at present in engineering and constructive departments of the industry, and we are keeping in close touch with them. For instance, we have given considerable attention to the Knight motor, but I do not think that the sliding valve engine will revolutionize the tappet methods generally employed, at least at present. The new type has proven its efficiency in tests, but the life of an automobile motor must be long, and that is our aim with the tappet valve type. Another motor tendency which we have taken up thoroughly is that of the six-cylinder engine, but we have not found them necessary, if, indeed, they are at all superior to the four cylinders. It has been our experience that the six does not warrant its substitution for the four-cylinder type, especially when the engine is turning over at a reasonable speed. Of course the six will pull more evenly on high at very low engine speeds, but with a well designed transmission, in regard to its ratios, there is no inconvenience in shifting. In fact, it has seemed that the necessity for shifting is less than the extra cost of maintenance and trouble to keep the car with the extra cylinders. At higher speeds we hold the four-cylinder preferable to the six or equal area.

"A most important feature of the industry lies in the commercial fields, and these lines are being seriously considered. The Locomobile Company has gone into the matter very deeply, for there are already a great many of our chassis used for business purposes, and in municipal fire and police departments. There is evidently a great future for this kind of motor-driven vehicle.

"I have noted with pleasure that there is a tendency among manufacturers at present towards longer stroke motors, for that is a type which we have advocated for a long while, at least for chain-driven cars. I believe, however, that the square cylinder is better for the shaft drive mechanism. In the latter case there is but a single reduction in gearing between the engine and the rear axle on high speed, that in the rear axle housing. Now, inasmuch as the housing must be made relatively small to give ample road clearance, it is evident that the bevel gear is rather small for the strain upon it, and the pinion is very small to give the required reduction. I think that with a long stroke engine the torque strains upon the gear teeth are greater than they should be subjected to, even with the use of strong alloy steels—that is, when the square motor of the same horsepower will give equal results with less strain. This can be proven mathematically and with the indicators.

"Our line for 1910 will show some refinements but almost no changes, and announcement of them will be made later."

The Locomobile Company has constructed nearly a thousand cars during the last season. At present it is working day and night, employing about 1,200 men in the two shifts, and still is shipping as fast as the cars can be completed and thoroughly tested. The new building, which is well under way, will give enough extra floor space to materially increase the output. It will be ready for occupancy by October 1. Then it is probable that architects will draw up plans for an extension of 300 feet to the main building, using some of the ground that has been reclaimed from the harbor flats. When this is completed, if the entire plant were on one floor it would cover a space 4000 feet long by 52 wide, according to Advertising Manager Kingman.

FIAT FACTORY ON THE HUDSON WILL BE UNIQUE

THE new plant of the Fiat Automobile Company, which is to be erected at Fairview, just outside of Poughkeepsie, N. Y., will embody many European ideas, and will resemble in many respects the present Fiat factory at Turin, Italy. It is needless to state that the Italian style of architecture will be employed; especial consideration will be given to the harmonizing of the building with its background, which is one of the most picturesque spots along the Hudson River.

It has not been decided whether steel and brick or reinforced concrete will be used, but the general layout will be along the lines of the best practice in factory construction. One of the distinguishing features will be the tower, 105 feet high, centrally located on the main building, which will contain all the offices and draughting rooms. This will be a point of attraction to vessels plying the Hudson and to trains passing on either the West Shore or the New York Central tracks.

The main building will be 363 by 140 feet. The first floor is to be used as a machine shop and assembling hall; the second floor will be for machines of a lighter character and the third floor for wood-working. The ceilings are high, and the side walls consist principally of immense windows, giving ample light and ventilation. From the main building extend a series of one-story wings 70 by 140 feet, five in number.

The future extension of the factory has also been taken into consideration. It is generally to be noted that factories are constructed for immediate requirements only, and when any extensions are necessary there results a conglomerate mass of buildings with no architectural connection. For the Fiat plant, however, extensions have already been designed in conformity with the style of architecture which will fit properly in the general scheme of construction.

Full attention has been given to all the practical requirements of factory design, especially with regard to sanitation and ventilation. An elaborate stand-pipe and sprinkler system will make the fire risk a minimum. Electricity will be the motive power. The high voltage of the alternating system will be transformed into low-voltage direct current, thereby making the power which is placed in the workman's hands perfectly safe.

The exterior of the building will be treated in light stucco, with roofs of red terra-cotta tile.

SOME LATE NEWS FROM TIREVILLE

AKRON, O., Aug. 14—The plant of the Buckeye Rubber Company, with the exception of the vulcanizing and finishing departments, was destroyed by fire this week. The loss has been estimated between $100,000 and $150,000, according to General Manager S. S. Miller, all covered by insurance. The main building, which was destroyed, contained the offices of the Buckeye Company, the manufacturere of Kelly-Springfield tires, and of the Consolidated Rubber Tire Company, of New York, the selling agent. The plant was working overtime to fill orders, and the officers announce that arrangements will be made to fill the accounts with little delay. The factory will be rebuilt.

Two new concerns have recently been organized and are beginning operations. The Akron Pneumatic Tire Making Company is manufacturing machines for stretching the fabric in the formation of the tires, and will either lease the machines or sell the rights on a royalty basis. The officers of the firm are: President, Charles A. Ley; vice-president, M. B. Kuhlke; secretary and general manager, James W. Meeker; and the officers, with E. T. Willams and H. C. Squires, form the directorate. The machine was invented by Mr. Squires and Mr. Meeker. The other newcomer is the Fall Rubber Company, of Cuyahoga Falls, which will produce automobile and buggy tires.

The annual picnic of the B. F. Goodrich Company was an immense affair, over 15,000 people attending. The company spent over $4,000 to make the affair a success, and was amply rewarded by the enjoyment of its employees and their numerous friends.

PIERCE BRANCH FOR TOURISTS ABROAD

PARIS, Aug. 12—The Pierce-Arrow Motor Car Company's branch has recently been transferred to 22 Avenue de la Grande Armée, where much better accommodations are available. The change was made necessary by the constantly increasing numbers of Pierce owners who tour abroad every year and make their headquarters here. The branch was originally established for the purpose of providing parts for Pierce cars used abroad, so that the owners might not be forced, in case of accident, to wait for a shipment from the factory. However, the establishment of the agency soon caused many owners who previously had rented cars in Europe to take their own cars with them, feeling secure in the knowledge that they could obtain spare parts as quickly as if they were using foreign cars. Since the early days the scope of the branch has grown until now it acts almost primarily as a bureau of information for Pierce owners and as an agent for them in the many formalities of entering cars, becoming a member of touring clubs, securing licenses and obtaining correct and detailed information regarding routes. Complete data can thus be obtained before sailing.

ATLANTA TO NEW YORK IN NINE DAYS

First to test the new touring route between New York and Atlanta, Ga., was R. E. O'Donnelly of the latter city, who arrived in the metropolis one morning last week in his Packard car after nine days on the road. He reports the journey a most delightful one. Mr. O'Donnelly's experience is especially interesting, as it demonstrates the practicability of the route for the ordinary tourist. For the first four days out of Atlanta it rained almost constantly, and the Southern roads, which are mostly of dirt or clay, became at times axle-deep in mud; but in spite of this handicap the party had no difficulty in making the thousand-mile trip in about seven days' actual running. Half a day was taken to enjoy the beauties of Roanoke and the Natural Bridge, Va., and another for the run to Gettysburg. The worst roads of the journey were encountered between Rock Mount, Va., and Greensboro, N. C., and between Greensboro and Salisbury, N. C. These could probably have been avoided by a cut-off through Winston-Salem, N. C.

The trip was made in Mr. O'Donnelly's 1908 Packard "30," which already had about 2,800 miles of touring to its credit. The car was driven by T. B. Dial, and came through without any troubles except a few punctures incident to the rough roads.

"MILTOUN" APPOINTED U. S. CONSUL

Francis Miltoun Mansfield is the complete name of the facile writer who has contributed such interesting European touring stories to the columns of THE AUTOMOBILE. Mr. Mansfield has been appointed consul for the United States at Toulon, which is France's greatest marine arsenal.

American manufacturers who are looking for a foreign source of distribution can make an effort in that direction by sending catalogues to Mr. Mansfield, who will be pleased to keep a quantity on file. Incidentally, autoists touring in that part of France will be able to obtain timely information by calling upon Mr. Mansfield at the American consular agency in Toulon.

FOR TOURISTS IN CENTRAL NEW YORK

BUFFALO, N. Y., Aug. 16—The touring department of the Automobile Club of Buffalo says that owing to the building of new roads between Avon, Geneseo and Mount Morris the regular route to Elmira is closed to traffic. The most satisfactory way at present is to take the Big Tree road from Batavia, through East Bethany and Peoria to Mount Morris, and thence to Danville by taking the splendid road past Craig Colony. The road from Geneseo Village to the cross-roads leading to Mount Morris and Groveland is closed, and the road further up the hill should be taken.

Newly Located Paris Branch of the Pierce-Arrow Motor Car Company—Foreign Headquarters for Pierce-Owning Tourists

CONCERNING CASTOR OIL LUBRICATION

Editor THE AUTOMOBILE:

In a recent issue of "The Automobile" a question was asked regarding the advisability of using castor oil for lubricating the cylinders of high-speed gasoline engines, and it was somewhat surprising to learn that such use of castor oil is considered the very highest practice.

It is not exactly clear upon what such a claim is based. The best lubricant to meet the severe conditions found in a combustion motor is one that in addition to being unctuous to a high degree does not possess more body than is consistent with fluidity; is free from any tendency to oxidize or gum; is free from acids or other corrosive ingredients and which has a high temperature of vaporization. Now, a vegetable oil does not satisfy these requirements, and castor oil is a vegetable oil. Brannt states: "By long exposure to the air castor oil becomes thick and forms a viscous mass, and even acquires poisonous qualities." Castor oil has a high viscosity and specific gravity and contains from 7 to 14 per cent of free, fatty acids. If admitted into the combustion chamber glycerine and fatty acids would be formed by the decomposition of the oil at the high temperature encountered and a heavy carbon deposit would be left behind.

This much has been acknowledged by even the most enthusiastic friends of castor oil and they admit that this oil gives the best results only in cylinders in which the pistons and piston rings fit unusually tight. For it cannot be denied that castor oil is poor stuff to be found in a combustion chamber, and therefore should not be allowed to pass the piston.

Since it is practically impossible to make rings so tight but that some oil will get by them into the combustion chamber, glycerine and fatty acids will be formed as pointed out above and an undue amount of carbon will be deposited. If the oil is not allowed to pass the piston rings the head end of the cylinder will of necessity be insufficiently lubricated. In any case its use would seem to be a choice between two evils.

Most authorities favor a light mineral oil for the lubrication of internal combustion motors. Castor oil may be satisfactory in some special cases, but any temporary results which could be obtained by the use of castor oil would be accomplished by flake graphite, by putting the graphite into the crankcase mixed with oil in the proportion of a teaspoonful of graphite in a pint, or by removing the spark plug and squirting a little graphite through the opening by means of an insect gun. By its use lasting results would be obtained instead of a merely temporary effect.

The function of flake graphite is to form a smooth, veneer-like coating over all bearing surfaces with which it comes in contact. It is therefore possible to not only use a lighter oil, but less of it, and should for any reason the oil supply fail there is always the assurance that the parts may run for a long time without serious cutting or bound pistons. By the use of graphite a higher compression is obtained, the engine runs easier and more power is available.

JOSEPH DIXON CRUCIBLE COMPANY,
Jersey City, N. J. L. W. Brooks.

GROSSE POINTE TRACK FOR CHALMERS

DETROIT, MICH., Aug. 16—When the work now under way is completed, the Chalmers-Detroit contest department will have facilities superior to any other automobile concern in the country, if not in the world. Just to the east of the Chalmers plant is the old Grosse Pointe track, known as the scene of some of the most famous trotting and pacing events in the annals of the harness world. A few years ago the track was sold to a western syndicate which purposed holding running meets, with bookmaking as the big feature. The Michigan law put a crimp in the plan and the track fell into disuse with the advent of the State Fair Ground course. Now the Chalmers-Detroit racing crews have been established in commodious quarters at the Grosse Pointe track, and where once the steppers held full sway, the bark of open ports and the whirr of automobiles clipping seconds off records on the fast mile track, furnish a new diversion.

CONNECTICUT'S TOLL BRIDGE FREED

HARTFORD, CONN., Aug. 16—The one remaining toll bridge across the Connecticut River in this State, that at Thompsonville, has been opened to free use. The stockholders accepted the offer made by the State for the structure, and the event was duly clebrated. Representative H. R. Coffin, known as the father of the free-bridge idea, was the first to cross in an automobile, using his 29-horsepower Columbia.

Where Packard Ignition Cable Is Made at Warren, O.

PLANT OF PACKARD ELECTRIC COMPANY

WARREN, O., Aug. 16—One of the largest and most substantial factory buildings in this city is the plant of the Packard Electric Company, the well-known manufacturers of ignition cable and other automobile accessories. The latest addition to this plant is the two-story brick building shown in the illustration. Part of the floor space is devoted to offices, part to the company's transformer department, and the rest to insulating and ignition materials. This cable has been on the market for the last eight years and has made an enviable reputation for itself. Its increasing popularity has necessitated doubling the capacity of the plant three separate times. The accompanying bird's-eye view shows the plant as it stands to-day.

SPOONER TO BE A PARTIAL DETROITER

DETROIT, MICH., Aug. 16—The biggest automobile colony in the world has received another accession of note, F. Ed. Spooner, veteran auto photographer, having decided to open an office in Detroit. Spooner will take personal charge of the local office, his partner, Wells, remaining in New York. The matter of location has not been determined, Spooner at present being quartered at the Pontchartrain. The local field has long been regarded as good picking by those in touch with the situation, owing to the great number of factories and the constant demand for fast camera work. Local men who failed to cultivate the business will now probably have occasion to repent at leisure.

AUTO FIRE ENGINES FOR BALTIMORE

BALTIMORE, Aug. 16—Chief Horton, of the Baltimore Fire Department, has recommended the use of horseless fire engines for the suburban sections of the city, with the result that two of these will be placed in commission in the fall as a test. If they work as expected, several more will be ordered. The Chief thinks they are just the thing for fighting fires in the outlying districts. He asserted, however, that as yet these machines have not yet developed enough power for practical fire work in the congested business districts.

ONE-LUNGER DISPLACED TWO-LUNGER

ATLANTIC CITY., Aug. 16—Charles Hinckleman, the local agent, some time ago closed a deal with the post office people here to put a little "one-lunger" Brush on the job of collecting and delivering mail. The bustling little car has been at work for over a week and has been making good with a vengeance, the former horse-drawn rig being miserably slow and inefficient in comparison.

MOTOR TRUCK CARRIES REVIVALISTS

WILMINGTON, DEL., Aug. 16—A large and heavy motor truck, used by the Charles Werner Company in the delivery of coal, has been pressed into service as a passenger-carrying vehicle between Wilmington and Brandywine Summit campmeeting, a distance of eight miles, and is making several round trips each day. The car has been provided with comfortable seats and a cover.

On a New Jersey Automobile and Motor Club Run in Midsummer

New Types of Storage Battery—The Westinghouse Storage Battery Company, which was incorporated July 12, has acquired all the plant, patents and equipment of the storage battery department of the Westinghouse Machine Company and of the General Storage Battery Company, and will manufacture, at Boonton, N. J., both the Westinghouse and Bijur types of batteries for those classes of service in which each has proven superior. The Westinghouse Company enters the field with greatly increased manufacturing facilities and the best engineering talent available, and will maintain thoroughly equipped testing laboratories to insure uniformity of materials and product.

Why Name Has Been Changed—The Thermoid Rubber Company explains that it changed its name from the Trenton Rubber Manufacturing Company in order to avoid confusion in the trade. Thermoid brake lining, such as this company has made for some years, has brought it into prominence, not in the automobile business alone, but in almost every business in which friction materials find a use. The Thermoid Company attributes this popularity both to the merit of its product and to the fact that the company has never made a claim for it which was not based on fact.

Auto Show Near New York—An automobile exhibit will be one of the features of the Queens-Nassau Fair at Mineola, L. I., to be held September 21-25. The fair is within a stone's throw of Krug's corner, made famous by the Vanderbilt races, and but 20 miles distant from New York via the Queensboro Bridge. Manufacturers and agents who wish to exhibit may make application to C. G. Miller, Hempstead, L. I. The fair is largely attended by automobile owners, and there are miles of good Long Island roads on which to demonstrate cars.

Motor Buggy Champions—The Holsman buggy again won its class in the Algonquin hill-climb this year, and the Holsman Company says that it was the only car competing that negotiated Perry Hill from a standing start entirely on high gear. The Holsmans were equipped with their special four-cylinder all-ball-and-roller-bearing motor, the only one, so far as is known, in existence, and its success demonstrates its utility.

Atlas Taxis for New York—The Atlas Motor Car Company, of Springfield, Mass., has just received an order from the Kayton Taxicar & Garage Company, of New York City, for 40 taxicabs, in addition to the 26 already in use by that company. If this order is shipped complete by October 15 it will be followed by another order for 34, completing an even hundred Atlas cabs for this one New York company.

Black Company Buys Crow Output—The Black Manufacturing Company of Chicago, makers of the Black high-wheeled automobiles, has arranged to market the entire output of the Crow Motor Car Company. The latter concern is a new one, located at Elkhart, Ind., and its first machine made its appearance a few days ago.

Another Win on New Departure Bearings—The Apperson Jack Rabbit which won the recent 202-mile road race at Santa Monica, Cal., was mounted upon New Departure ball bearings. This car established a new American record, its average time over the 8.4-mile course being 64.45 miles per hour, as against the 64.3 in the last Vanderbilt.

Enlargement for Thomas Factory—The E. R. Thomas Motor Company has arranged for a large addition to its factory in Buffalo. A two-story building 104 by 167 feet will be erected at a cost of about $16,000.

Bosch Magnetos for Winton Cars—Announcement has been made that the new Winton cars will have Bosch magnetos as equipment.

IN AND ABOUT THE AGENCIES

Grabowsky, California—A representative of the Grabowsky Power Wagon Company, of Detroit, who recently made a trip alon gthe Pacific Coast, made agency arrangements with Hawley, King & Company, of Los Angeles, Cal., and with Waterman Brothers & Company, of Fresno, Cal.

Walden W. Shaw Company, Chicago—The Walden W. Shaw Company has given up the agency for Thomas cars and will in the future handle the imported Berliet and the Columbia electric.

Haynes, St. Louis—The Haynes Automobile Company of Missouri has temporarily located at 4530 Delmar avenue.

RECENT BUSINESS CHANGES

Banker Brothers' Company Changes Name—The old Banker Brothers' Company, which has been a pioneer in automobile matters in Pennsylvania, now located at Pittsburgh, will hereafter be known as the Pioneer Motor Car Company. The officials will be the same as previously and the cars handled will be the Chalmers-Detroit, Hudson and Lozier.

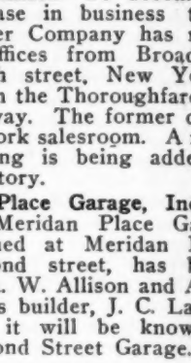
Queen City Garage, Battle Creek, Mich.—Don Cole, who has for some time been connected with the Olds Motor Works, of Lansing, has purchased a half interest in the Queen City Garage, of Battle Creek. A partnership has been formed with F. W. Ellis, the former proprietor. The agency for the Jackson will be continued and a repair department added.

Ajax Expansion—To accommodate a great increase in business the Ajax-Grieb Rubber Company has moved its executive offices from Broadway and Fifty-seventh street, New York, to a large suite in the Thoroughfare Building across the way. The former offices will be a New York salesroom. A new three-story building is being added to the Trenton factory.

Meridan Place Garage, Indianapolis, Ind.—The Meridan Place Garage, recently opened at Meridan Place and Twenty-second street, has been purchased by A. W. Allison and A. L. Duggan from its builder, J. C. Lazarus. In the future it will be known as the Twenty-second Street Garage.

PERSONAL TRADE MENTION

Lewis M. Crittsinger has joined the R. L. Morgan Company, of Worcester, Mass., as purchasing agent. Mr. Crittsinger is one of the youngest and at the same time best-known men in the trade, and to take up his work with the Morgan Company resigned from the Chal-



Lewis M. Crittsinger

mers-Detroit Motor Company. He has also been connected at times with the purchasing departments of the E. R. Thomas Motor Company, of Buffalo, and the Ford Motor Company, of Detroit.

Fred C. VanDerhoof has been appointed manager of the Olds Motor Works Branch in Philadelphia, handling the Oldsmobile and the Oakland, both products of the General Motors Company. Mr. VanDerhoof is one of the best-known men in the industry, having been associated with it for a number of years, first in the branch department of the Ford Company, and then with the Bergdoll Company in the Quaker City. He managed the Ford branch in that city for several years and was general manager of the Bergdoll Company when it had the agency for the Chalmers-Detroit, Thomas and a number of

other makes. He has already taken charge of the Olds branch house in Philadelphia and will have an extensive territory along the Atlantic coast to the South.

R. B. Van Dyke has been appointed manager of sales of the automobile department of the American Locomotive Company. Mr. Van Dyke has been with the company for a number of years and with the automobile department since its inception. His headquarters will be at the New York office, 1886 Broadway.

Frank H. Bowen has joined the sales force of the Simplex Automobile Company at the new headquarters, 1860 Broadway, New York City. Mr. Bowen has been connected with the automobile trade for eight years and was recently with the Harry S. Houpt Company in selling Thomas cars.

P. C. Chrysler has been appointed manager of the new Chicago branch of the General Vehicle Company, of Long Island City, N. Y. He will be remembered as formerly connected with the Rainier and American Locomotive.

R. S. Ireland has been appointed sales manager of the Ajax-Grieb Rubber Company and will be hereafter responsible for the distribution of Ajax tires. He was formerly Eastern sales manager of the company.

C. E. Reddif has been appointed designer of the Columbia Motor Car Company. Mr. Reddif served in a similar capacity for the Electric Vehicle Co.

P. A. Williams, Jr., sales manager of the Atlas Motor Car Company, started August 17 for an extensive visit to Bermuda.

OBITUARY

Arthur E. Adams, manager of the Algonquin Motor Car Company of Boston, died in that city on August 11. Mr. Adams was well known throughout the automobile trade, for he had been associated with it for many years, starting with the Mobile Company in 1899. Some years later he went to Boston with the Pope branch and at times was associated with agencies until he took hold of the Algonquin Company, the agent for the Oldsmobile. A large delegation of the trade attended the services on Saturday.

TAXICAB AND TRANSIT

Lebanon, Ky.—Great success has attended the new automobile stage line between this place and Springfield. The distance is 20 miles, but the train connections are so roundabout and infrequent that nearly a day is necessary to go between the points by rail. Two automobiles have been purchased—one for reserve—and two round trips are made daily, one in the morning and the other in the afternoon. The car has been full on each run so far. Louisville capital is behind the enterprise, and other lines are contemplated where necessary.

Washington, D. C.—Rock Creek Park will probably be opened to a line of buses to make access to the grounds easier. One of the capital sightseeing companies has asked for permission to operate six machines,with a seating capacity of from 30 to 40 persons, on a regular schedule from the traction terminals. They would run on a two or three-mile circuit, tapping convenient points, and a 10-cent round-trip fare, with stop-over privilege, is planned.

WHITE IN MILITARY MANEUVERS

BOSTON, Aug. 16—White steamers are playing a prominent part in the military maneuvers this week. First of all, a White car is being used by General Wood, who is the umpire in the big war game which is being played between the Massachusetts militia, on the one side, and detachments from the National Guards of New York, Connecticut and the District of Columbia, on the other side. In addition, three White Steamers are attached to the headquarters of General Brigham, who commands the Massachusetts troops, and is in charge of the "defense" of Boston. Furthermore, the White ambulance, belonging to the Massachusetts National Guard, will be in active service, as will the White car of Quartermaster Sergeant Hathaway. The latter car will be run on kerosene and will be used in traveling about the powder magazines and other places where the military regulations prohibit the storing of gasoline in any shape or form. Finally, Colonel George Harvey, editor of *Harper's Weekly*, has sent his White touring car to the front for the use of the war correspondents and photographers assigned to cover the maneuvers for his paper.

NEW AGENCIES ESTABLISHED

Overland and Marion: New York—Charles E. Riess & Son, East Orange, territory including New York, Brooklyn, Long Island, Staten Island and as far north as Poughkeepsie. Quarters secured at Broadway and Fifty-seventh street.

Studebaker: Trenton, N. J.—C. P. Weeden, the Valentine-Weeden Company, 432-438 Princeton avenue. Including Studebaker-E-M-F and Studebaker-Flanders 20

Detroit Electric: Nashville, Tenn.—Southern Electric Car Company, temporarily located with the Tennessee Automobile Company.

Hupmobile: Atlanta, Ga.—E. D. Crane & Company, for the northern district of the State, in addition to the Regal.

Oldsmobile and Oakland: Wilmington, Del.—Pennsylvania Garage, Pennsylvania avenue and Clayton street.

Reo: Houston, Tex.—Guilliaumo Auto Company, 707 Rush avenue, for South and East Texas.

Chase: Cleveland—E. P. McGollier, 1926 Euclid avenue.

Hupmobile: Louisville, Ky.—Fulton Mandeville.

Oakland: Philadelphia—Fred C. VanDerhoof.

Lozier: Trenton, N. J.—J. B. Gundling.

RECENT INCORPORATIONS

International Aerial Navigation Company, Galveston, Tex.—Capital $1,000,000. To establish airship service for freight and passengers to all parts of the United States, Mexico and other countries. President, Dr. F. J. Field; treasurer, Dr. Fred Terrell; secretary, V. P. Brown. To use 12-passenger machines, constructed in St. Louis, beginning operations on January 1, 1910.

Falls City Automobile & Garage Company, Louisville, Ky.—Capital $50,000. To act as wholesale and retail traders in automobiles, motorcycles and other vehicles and to operate garage and repair shop. Incorporators: W. J. Day, H. J. Hogan, H. C. Shanks, B. B. Bales.

Husson Motor Company of America, New York—Capital $12,000. To manufacture gas engines, motors, machines, automobiles, aerial vehicles, motor boats, etc. Incorporators: John Husson, J. J. Hogan, W. E. Young.

Tygard Engine Company, Plainfield, N. J.—Capital $250,000. To manufacture Tygard engine, automobiles, carriages, etc.; Incorporators: G. M. Neagley, W. E. Buhl, F. C. Tygard, E. E. Tygard, A. F. Randolph.

C. F. Splitdorf, New York—Capital $500,000. To manufacture electrical machinery, ignition apparatus, automobile parts and sundries. Incorporators: Charles F. Splitdorf, John Splitdorf, P. J. W. Kelley.

Linkroum Automobile Company, Newark, N. J.—Capital $20,000. To manufacture and deal in automobiles, motors, etc. Incorporators: Courtlandt Linkroum, William H. Linkroum, C. R. Erith.

Instantaneous Lighter Company, Columbus, O.—Capital $30,000. To manufacture automatic lamp lighters for automobiles and other purposes. President, F. C. Barger; treasurer, L. B. Barger.

Automobile Rim Securities Company, New York—Capital $150,000. To manufacture automobile and vehicle parts and accessories. Incorporators: Henry W. Goddard, Robert H. Gay, Edward Weck.

Essex County Overland Company, Newark, N. J.—Capital $100,000 To manufacture and deal in automobiles and motorcycles. Incorporators: L. F. Crocker, K. D. Crocker, H. H. Poole.

Union Motor Car Company, Newark, N. J.—Capital $125,000. To manufacture automobiles, locomotives, etc. Incorporators: P. Broderson, A. Broderson, F. C. Stowers.

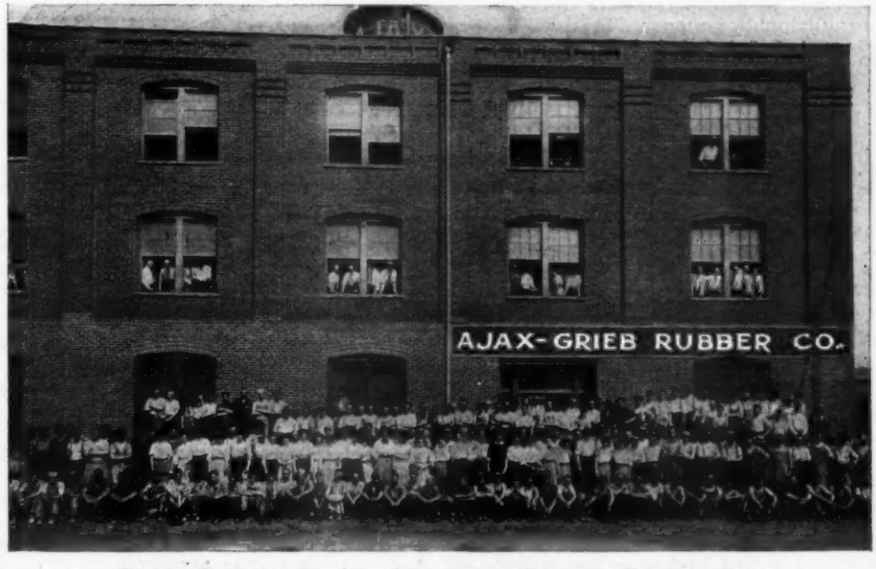
Pope-Hartford Company, Newark, N. J.—Capital $30,000. To manufacture and deal in automobiles. Incorporators: C. C. Pilgrim, Mary E. Lane, J. M. Hulbert.

Hall Car Company, New York—Capital $20,000. To manufacture engines, cars, locomotives and vehicles. Incorporators: T. M. May, B. H. Howell, H. P. Hall.

Metz Company, Waltham, Mass.—Capital $500,000. To deal in automobiles. President, J. C. Robbins; treasurer, C. J. Spiegleberg.

Continental Motor Manufacturing Company, Muskegon, Mich.—Capital increased from $225,000 to $500,000.

Trackless Trolley Company, New York—Capital $150,000. C. E. Barrett, A. L. Newman.



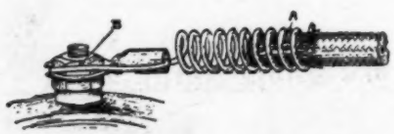
Factory Forces of the Ajax-Grieb Rubber Company, Trenton, N. J.

Information for Auto Users

"Red Rib" Ignition Cable—Accessory jobbers and dealers are pleased to find that the "Red Rib," which has been so cleverly advertised with a running fire of questions in the trade journals during the last few weeks, has turned out to be a line of popular-priced ignition cable of American manufacture. The cable will be handled by the National Sales Corporation of New York, which also originated the "Red Head" spark plug, and is noted for the quality of its products as well as of its advertising. The company will endeavor to minimize the selling and distributing expenses incidental to the launching of a new article, and maintain a schedule of popular prices. The cable will be made with both rubber and braided insulation, in primary and secondary and all intermediate sizes. Both the rubber and braided types will be listed at the same price, as it is the intention to simplify this business, as was done with the "Red Head" spark plug. A high standard of manufacture has been set and the cable had to undergo severe tests under the eyes of ignition experts before receiving the final approval.

A New Idea in Terminals—A terminal for the prevention of trouble as caused by a broken electrical circuit has been brought out by Read, 37 Kingston avenue, Brooklyn, N. Y. This is not only useful as a preventive of trouble along this line, but where used with a spark plug or other binding post, having nuts to screw on or off, it forms an efficient nut lock as well. In substance, it is simple in the extreme, being merely a coil of brass wire soldered with the ordinary terminal end of copper. This coil of wire may, however, have one or two diameters, according as it is intended for use with small primary wires or large secondaries. In addition, there is soldered in another short piece of wire, which is bent over and lays flat parallel to and about 1-16 inch above the copper terminal. It is this latter portion that forms the nut lock, or it may be used as the connection proper, when the spark plug binding post has a hole through it, the wire slipping through this hole.

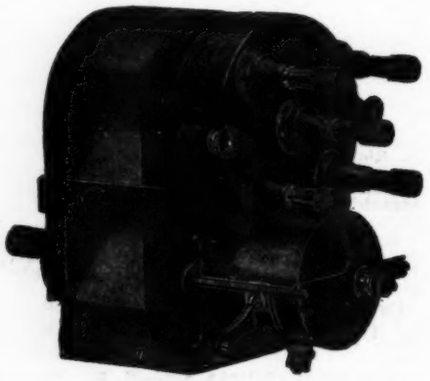
READ TERMINAL HAS AN EXTRA WIRE



SHOWING HOW THE LOCK WORKS

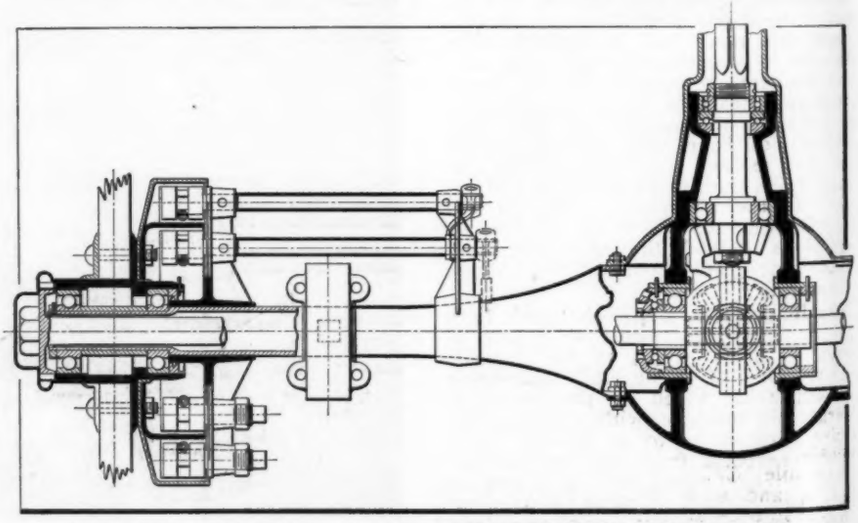
To connect these spring terminals to the wires, the insulation is cut away for half an inch, and the fine wires spread out and turned back over the outside all around. The terminal is then jammed or screwed on over this, the contact being sufficient. The coil of wire will absorb all vibration, so that with this device the danger of broken circuits due to this cause is eliminated.

Kurtz Alternating-Current Magneto—The Hercules Electric Company, of Indianapolis, already favorably known through its direct-current magnetos for stationary engine use, has brought out an alternating-current machine of the usual type for automobile use. For this purpose the company selected as the most desirable the low-tension design with separate coil, which allows ample space for insulation of the high-tension winding and also permits the use of a battery circuit through the same coil and distributor. Much attention has been given to the design, with the view of having the necessary functions carried out by the fewest and simplest parts. It is stated that the total number of parts is one-third less than on most magnetos. At the same time there is nothing freakish in the construction. The entire circuit-breaker box may be removed by simply releasing a spring with the fingers, no wrench or screw-driver being required. The points of the contact-breaker can be adjusted with a nail or bit of wire. The points are of iridium-platinum. Heavy bronze bearings are used, and insulation of the best vulcanized rubber. All gears are enclosed and practically noiseless. The magneto frame is cast in a solid piece, and the pole pieces are riveted in, making a construction extremely strong and adapted to stand excessive jarring and vibration. The magneto was thoroughly tested before being offered to the trade, and the Hercules Company feels that it will prove a worthy member of the Kurtz line.



KURTZ MAGNETO IS LOW TENSION USED WITH SEPARATE COIL

Attractive Live-Axle Design—A live rear axle which embodies several good features and shows evidence of careful designing has been brought out by the McCue Company, of Hartford, Conn., and is illustrated in the accompanying line drawing. The axle proper is of pressed steel welded laterally, with openings front and back. Apparently the two halves of the axle are exactly alike; this, of course, greatly simplifies the manufacturing. The propeller shaft is designed to be of the one-joint type, enclosed in the torsion tube; the rear end of this tube is expanded and bolts over the front opening in the axle, and the front end carries a forged steel yoke, to be hinged to the cross member of the frame. Thus none of the torsion strains are carried by the universal joint. The differential and bevel gear and pinion are carried on a frame inserted through the rear opening of the axle. The axle shafts are full floating, with hub clutches integral. Annular ball-bearings of ample size are used throughout, with separate self-seating thrust bearings. The spring seats may be made either to key on or to swivel. The rear hubs carry two sets of brakes, both internal expanding, on concentric drums of ten and fourteen inches diameter, respectively. The brakes are operated by means of camshafts, easily adjustable, and these are extended so as to bring the brake connections inside the frame. The axle is made in two sizes, for cars above and below 2,500 pounds weight. The design is very attractive and the manufacturers state that they use only the best materials.



EXCELLENT DESIGNING IS AT ONCE APPARENT IN NEW McCUE REAR AXLE